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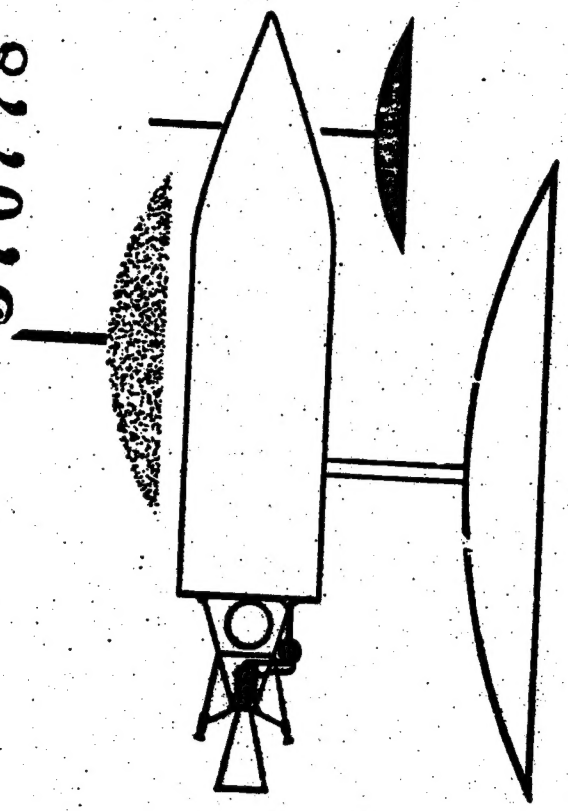

Pied Piper DEVELOPMENT PLAN

VOL. II SUB-SYSTEM PLAN

L. Ground Support and Test Instrumentation

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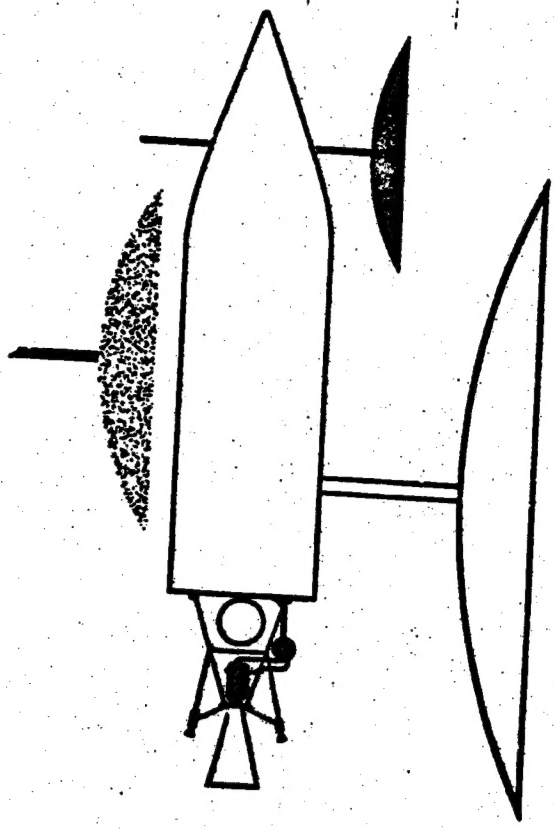

Pied Piper DEVELOPMENT PLAN

VOL. II SUB-SYSTEM PLAN

L. Ground Support and Test Instrumentation

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FOREWORD

The Advanced Reconnaissance System (ARS) consists of a satellite vehicle containing equipment to perform visual, ferret, and infrared reconnaissance, together with the necessary system of ground stations and data processing centers.

This Development Plan for the accomplishment of the ARS was prepared by the Missile Systems Division, Lockheed Aircraft Corporation and its subcontractors, CBS Laboratories and Eastman Kodak Company. The specifications for the system were determined in the course of a one-year study now being conducted for the United States Air Force under contract AF 33(616)-3105. The plan is presented in two parts; Volume I, System Plan, and Volume II, Subsystem Plan. The subsystems are described in separate books, Volume II-A through II-L.

PIED PIPER DEVELOPMENT PLAN

VOLUME I. SYSTEM PLAN

VOLUME II. SUBSYSTEM PLAN

A. Airframe

B. Propulsion

C. Auxiliary Power

D. Guidance and Control

E. Visual Reconnaissance

F. Electronic Reconnaissance

G. Infrared Reconnaissance

H. Vehicle Electronics

I. Airborne Test Systems

J. Vehicle Intercept and Control Ground Station

K. Ground Data Processing

L. Vehicle Ground Support

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RDB PROJECT CARD

TYPE OF REPORT

REPORTS CONTROL SYMBOL DD-RDB(A)48

1. PROJECT TITLE

VEHICLE GROUND SUPPORT SUBSYSTEM FOR ADVANCED RECONNAISSANCE SYSTEM (Uncl)

(Pied Piper)

2. SECURITY: Secret

3. PROJECT NUMBER: 1115

4. INDEX NUMBER:

5. REPORT DATE: 1 March 1956

6. BASIC FIELD OR SUBJECT:

7. SUBFIELD OR SUBJECT SUBGROUP:

7A. TECH. OBJ.:

8. COGNIZANT AGENCY:

9. DIRECTING AGENCY:

OFFICE SYMBOL:

TELEPHONE NO.:

10. REQUESTING AGENCY:

11. PARTICIPATION, COORDINATION, INTEREST:

12. CONTRACTOR AND/OR LABORATORY:

Lockheed Aircraft Corporation
Missile Systems Division

CONTRACT/W.O. NO.: AF 33(616)-3105

13. RELATED PROJECTS:

14. DATE APPROVED:

15. PRIORITY: Maximum

16.

17. EST. COMPL. DATES

RES.

DEV.

TEST

OP. EVAL.

18. FY	FISCAL ESTS. (M $)

19.

20. REQUIREMENT AND/OR JUSTIFICATION

a. The vehicle ground support subsystem provides facilities for vehicle launching, logistical methods and procedures, system and component testing, component evaluation testing. This subsystem also identifies specialized ground handling, check out, test equipment, and processing necessary to prepare the ARS vehicle preparatory to flight evaluation.

b. Specific applications and procedures which will be established in the ground support area during the research and development program will serve as a guide to establish methods which will be employed when the ARS becomes operational. The results expected from this work can be obtained in no other manner; however, other programs currently in process will furnish many important inputs.

c. This work will increase the capability of the program participants to indoctrinate personnel and supply functional data useful in modifying ground support handling techniques, logistics programs and equipment checkout procedures. Programs will also be initiated to correct any deficiencies in reliability, human factors and personnel safety.

22. RDB	SN	CN	IC & P	X.	L.	C.

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L, p 1

MISSILE SYSTEMS DIVISION

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1. PROJECT TITLE	2. SECURITY OF PROJECT	3. PROJECT NUMBER
VEHICLE GROUND SUPPORT SUBSYSTEM FOR ADVANCED RECONNAISSANCE SYSTEM (Uncl) (Pied Piper)	Secret	1115
	4.	5. REPORT DATE 1 March 1956

21 a. Summary of Operational Scheme

The ultimate attainment of a facility, with supporting equipment, which insures an acceptable logistics plan and provides methodical assembly, pre-launch checkout, handling and erecting the ARS booster-vehicle combination on the firing pad is the primary objective of this subsystem.

Prior to the acceptance of a final scheme many preliminary steps must be analyzed and either accepted, modified, or discarded. The step-by-step analysis commences with the first fabrication of a flight hardware article and continues through flight test to data processing and assimilation. First fabrication of flight hardware assumes that component testing and evaluation has been accomplished in order to select and modify components and to insure their reliability. For the most part component testing and evaluation will occur at "in-plant" test facilities. These test facilities are various laboratories devoted to testing such elements as telemetry, transducers, electronics, gyros, controls and computers.

Fabrication and assembly facilities present no unusual requirements that need be detailed herein, since vehicles will be transported fully assembled to the various sites.

A System Test Facility will be required for complete vehicle systems tests under hot run conditions. This facility will also provide for separate sustainer and control engine tests along with auxiliary power units and other hazardous components testing which cannot be performed at the "in-plant" site.

For the initial flight test programs a complete test base will be required at AFMTC, at Cape Canaveral, Florida. Test programs that will be conducted at this facility include the system test vehicle (STV), the orbital test vehicle (OTV), the nonorbiting vehicle (NOTV), and payload test vehicle (PTV).

The requirements for launching of operational test vehicles dictate the need for an alternate launching site, separate from AFMTC. Consideration has been given to the west coast and the Pacific area (Hawaiian Islands). Since the logistic problems for the island site are not much more difficult than for an isolated continental site, and because a data processing and an intercept station are both planned for the Hawaiian Islands, this location was used in analyzing a typical alternate site.

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21 b. Approach

The approach to satisfying the ground support requirements will begin by indoctrinating personnel assigned to duty at the facilities. This will be accomplished by integrating these personnel in the design fabrication and liaison groups in their particular fields to acquaint them with fundamental problems likely to occur in the field. They will be phased into the proper facilities as their services are needed.

21 c. Follows on p 4

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21 c. Subsystem Tasks

1. a. In Plant Facilities

b. Contractor: Lockheed Aircraft Corporation, Missile Systems Division.

c. Research, development and engineering tests for design and evaluation will be the responsibilities of the various departments assigned subsystem and systems tasks. Existing test equipment will be expanded and supplemented by the addition of considerable specialized equipment.

The normal facility expansion will include electronic, telemetry, gyro simulators, propulsion components, structures, materials, environmental and control test equipment. The requirements for specialized facilities include gyro environment tables, rapid altitude chambers, electronic system checkout consoles, hazardous fuel chemistry and material testing, and life test equipment. The basic philosophy of all in-plant facilities is to provide services to duplicate within reason "in-flight" conditions on the ground.

2. a. System Test Facility

b. Contractor: Lockheed Aircraft Corporation, Missile Systems Division.

c. The facility for supporting tests of the propulsion system, vehicle system and hazardous components is to be isolated from the general manufacturing and office areas in the interest of safety. This facility is to be divided into three sections, one for vehicle and propulsion, one for components and hazard, and a central instrumentation data acceptance office.

Basic vehicle system, propulsion system and full environmental (altitude, etc.) testing will be centered around a single control building. Provision for control booths, offices, shops and local fuel support control will be in this building. Four pads are planned in this area to be operated as desired. There will be two for vehicle testing and calibration, one for environmental, and one for system investigation.

The component and hazard area is to be devoted to testing materials, auxiliary power units in suitable altitude chambers, components, pneumatic devices under radiation and similar conditions. The general arrangement again is to be based upon a single

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control building housing control booths, cells, shop and office area. The fuel support for the two areas will be designed to properly contain any fire and to suppress all toxic vapors and waste by filtration..

The central instrumentation and data facility will handle all information from the various areas. Multiple quick-look, control data recorders, "go no-go" inspection control and tape recorders will be provided. The existing computers will be utilized for reduction and analysis.

A change to dangerous propellants will possibly require relocation at a remote site.

3. a. AFMTC

b. Contractor: Lockheed Aircraft Corporation, Missile Systems Division and Government Furnished Equipment.

c. The initial flight program of the System Test Vehicle, Orbital Test Vehicle and the Payload Test Vehicle will be activated at AFMTC, Florida. Facilities required for this program are independent of existing X-17 Facilities. One-half of a Missile Assembly Building, approximately 16,238 sq. ft., is required for assembly and checkout of all three vehicles.

Launching Support for the STVs will be on a joint use basis with the X-17 program. Specifically, common use of the pad, blockhouse and modified firing console is intended. Launching support for the OTVs and PTVs will require use of a WS-107 launch pad and blockhouse for independent checkout. Joint use of a WS-107 pad and blockhouse with Convair crews to accomplish mating with the booster and final checkout will also be required.

With the addition of supplementary equipment to the X-17 ground station and mobile checkout consoles, it will be possible to use this gear commonly for both programs. Special checkout equipment for major subsystems will be required for checkout and secondary subsystem modification. Ground handling equipment in general will duplicate that used on the X-17 project because of simultaneous schedules.

4. a. Alternate Launching Site

b. Contractor: Lockheed Aircraft Corporation, Missile Systems Division.

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c. Basically, the alternate site will be another Cape Canaveral with the supporting features of Patrick Air Force Base incorporated. The major difference is the emphasis on data acquisition and reduction as opposed to in-flight tracking.

To support the eighty personnel required in the test operations, it is estimated an additional 750 people will be required for program support at the alternate site. The site should include two launching pads and blockhouses, data and telemetering building, assembly building, control equipment, electronic equipment, liquid oxygen plant, fuel and oxygen storage, generator plant, complete internal communication, outside communication, tracking support, range safety, housing, ground equipment, air conditioning of critical areas, air-strip logistics support, transportation and special electronic, radar and nuclear equipment.

5. a. Vehicle Intercept, Control and Data Stations

b. Contractor: Lockheed Aircraft Corporation, Missile Systems Division and Government Furnished Equipment.

c. Initial plans and considerations have been formulated on the premise that facilities will be required at three different locations for intercept, control and data processing for the ARS. Locations that provide maximum intercept capabilities of the vehicle are of primary consideration. As a result of studies conducted in this regard and described in detail in the second Pied Piper Quarterly Progress Report, locations have been tentatively selected for installation on the East Coast, West Coast and in the Hawaiian Islands. The requirements for equipment and instrumentation for these stations are discussed under Subsystem J, Vehicle Intercept and Control, Ground Station and Subsystem K, Ground Data Processing.

6. a. Advanced Reconnaissance System Intelligence Center

b. Contractor: Lockheed Aircraft Corp., Missile Systems Division
Eastman Kodak Company
CBS Laboratories
GPF

c. Tentative requirements for a central data assimilation center are presented in the volume describing Subsystem K, Ground Data Processing. In general, it is expected that the facilities will be operated by contractor personnel in order to provide a stable organizational structure. Location of the facility has not been

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suggested in the requirements; however, it should be where transportation for both military and contractor personnel is readily available. This includes an airstrip for all types of military aircraft. The site should also be easily accessible to top level military strategists. The vicinity of Washington, D.C. would satisfy these requirements.

Equipment and instrumentation required for the Intelligence Center will, for the most part, be fabricated by the Lockheed Aircraft Corporation, Missile Systems Division, the Eastman Kodak Company and the CBS Laboratories.

This task encompasses the obvious aspects of real estate acquisition as well as design, construction and installation of building facilities. Shops for general maintenance and repair will be included. Additional instrument shops and electronic laboratories will provide for the installation and maintenance of the components of the center.

7. a. Personnel Protection and Material Safety

b. Contractor: Lockheed Aircraft Corp., Missile Systems Division.

c. Consideration has been given to personnel protection and material safety in planning of all facilities, handling and test equipment. Protection of operational personnel through use of protective clothing and sprays, and provision of escape areas is a standard practice used in the propulsion and chemical industries. Protection of "nearby" personnel and work areas will be by filtration (modification of vapors to secondary products) of vapors and deep sea disposal of waste liquids and solids.

Other buildup and operational personnel will be shielded against blast, noise and vibration by the latest design techniques developed by the propulsion industry. Ground vibrations are of low magnitude and are not considered a serious problem.

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21 d. Other Information

Detailed requirements of base support and equipment requirements are presented in the appendix to this subsystem. Many of the support services required for the vehicle ground support program currently exist at AFMTC. Those not currently in use are contained in the AFMTC development plan for support of the ICBM program. These support services will be employed to the fullest extent in the ARS program and only specific items not currently planned for at AFMTC will be delineated in the support requirements detailed in the following tabs.

21 e. Background History

The requirements that have originated specifically for ARS ground support can be traced in part to the effort of LMSD in establishing the X-17 (RTV) as a forerunner of the WS107A (ICBM) at AFMTC. Many deficiencies in the operation of the range have been uncovered and in the interest of expediting the development of a satellite vehicle continued surveillance of the base operations must be critically examined to furnish procedures and data required to establish an alternate launch facility.

21 f. Future Plans

The ARS ground support subsystem will adequately comply with the requirements that have been dictated in an effort to permit the achievement of orbital capabilities with maximum reconnaissance utility. Since the booster for this system is the initial stages of the WS-107 A program flight article the support plan will adhere as closely as possible to the WS 107 A system. Future plans will emphasize the compatible design and construction of handling equipment and other base and range support equipment so long as orbital and reconnaissance capability can be demonstrated.

21 g. References

1. Lockheed X-17 Facilities Requirement Report, MSD 1075

2. Ramo-Wooldridge - Collection of WS 107 A program technical data, submitted to Pied Piper Phase I Contractors January 3, 1956

3. Lockheed First Quarterly Progress Report, MSD 1363, Sections 5.3, 5.4, 5.5.

4. AFMTC Operations Directive, 11-55.

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MISSILE SYSTEMS DIVISION

TABS

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Subsystem L - VEHICLE GROUND SUPPORT

Tab 1 - General Design Specifications

I. GENERAL

A. Statement of the Problem

The problem of this subsystem is to provide plans, designs and schemes for facilities, ground handling, test equipment and general support of the Advanced Reconnaissance System.

B. Approach

Preliminary studies have been made in order to evaluate the total problems that will be encountered in establishing a suitable vehicle fabrication schedule to match testing and flight schedules. In addition, consideration has been given to component evaluation tests at in-plant laboratories before components are approved for subsystem use and subsequent subsystem prototype installation.

An evaluation has been made of the preliminary requirements for the Systems Test Facility which will be primarily concerned with testing of liquid propellant engines, propulsion system, complete vehicle systems during hot firing runs, complete vehicle systems in radiation environments, and other hazardous components.

The present X-17 facility at AFMTC has been critically examined in an effort to provide a well organized scheme of operation for the support of the Advanced Reconnaissance System and to insure that the operation will integrate easily and remain compatible with the WS 107A operation.

Consideration has been given to the problems that will be encountered in establishing an ultimate launching facility which for purposes of discussion appears to have requirements for launching and tracking similar to the current facility at AFMTC although functional support will not be as elaborate.

The tentative requirements for establishing three vehicle intercept and control stations which will serve also as data processing stations have been established.

In addition a study has been made to plan for a central intelligence center which will serve as the focus for data interpretation, data analysis, and data display. Problems of manning the data stations and intelligence center have been considered and discussed in detail in Subsystem K - Ground Data Processing and Subsystem N - Intelligence Operational Training.

C. Solution or Recommendations

Since in-plant facilities of the vehicle ground support subsystem involve the design of many different units of test, check-out, handling and processing equipment and since much of this equipment is standard laboratory equipment or handling equipment as used on other current programs no effort has been made to present general design specifications of the units. Equipment lists and facility requirements have been delineated in the following tabs.

The principal ground handling units will be similar to those used on the X-17 (RTV) program which were previously presented and discussed in the first Pied Piper Quarterly Progress Report - Volume IV.

Re-evaluation of the vehicle logistic flow scheme has been made and is presented in Fig. 1.

A proposed manufacturing schedule for vehicle hardware fabrication is presented in Fig. 2. The necessity of providing System Test Vehicles (STV) for component flight test during the period from October 1956 to December 1957 indicates immediate action in the hardware fabrication phase. Since the first units of the STV will be unseparable units of simple construction it appears that the units can be constructed in approximately one month.

Preliminary engineering drawings will be available at the date of receipt of contract for the STV units. The modification to the RTV-sergeant booster will be only an increase in fin size, however, it will not be necessary to accomplish this task for STV #1 through STV #4 because ballast will be added to simulate weight for the satellite nose configuration. Little tooling beyond the present RTV tooling will be necessary because of the simplicity of construction. Fabrication of the telemetry package will be available immediately. Fabrication of the electrical and electronic components can commence immediately and will be more or less identical to the scheme used presently in construction of RTV components.

The plans for the fabrication of other vehicles which include "dog birds", captive test vehicles, Non-Orbiting Test Vehicles (NOTV), Orbital Test Vehicles (OTV), Payload Test Vehicles (PTV) and Operational Vehicles (OPW) use existing facilities available to Lockheed with some expansion regarding equipment and testing.

A survey was conducted by the manufacturing branch to ascertain the capabilities in the event a contract was awarded this facility. Detailed information is presented in Appendix L.

AFMTC FACILITY. Consideration has been given to the handling of the vehicle with regards to assembly on the Atlas booster. Although little detail concerning the type of equipment which is to be supplied at the Atlas launching pads has been supplied by the Air Force for study, preliminary design of the vehicle places emphasis on using cranes and hoisting gear similar to that which will be used for handling and assembly of the Atlas warhead. If the more advanced vehicles require additional clearance of the Atlas gantry equipment, it appears that a modification to the equipment can be made as the subsequent pads are built. It appears also that the early vehicles, at least through Program III of the ARS, will not require such a modification to the gantry equipment but will involve only modifications to electrical and electronic wiring and equipment.

A critical examination will be made of the Atlas ground handling and launcher design to provide a foundation for design optimization with the ARS vehicle. This design will be evolved at a later date for inclusion at the Alternate Launch Facility.

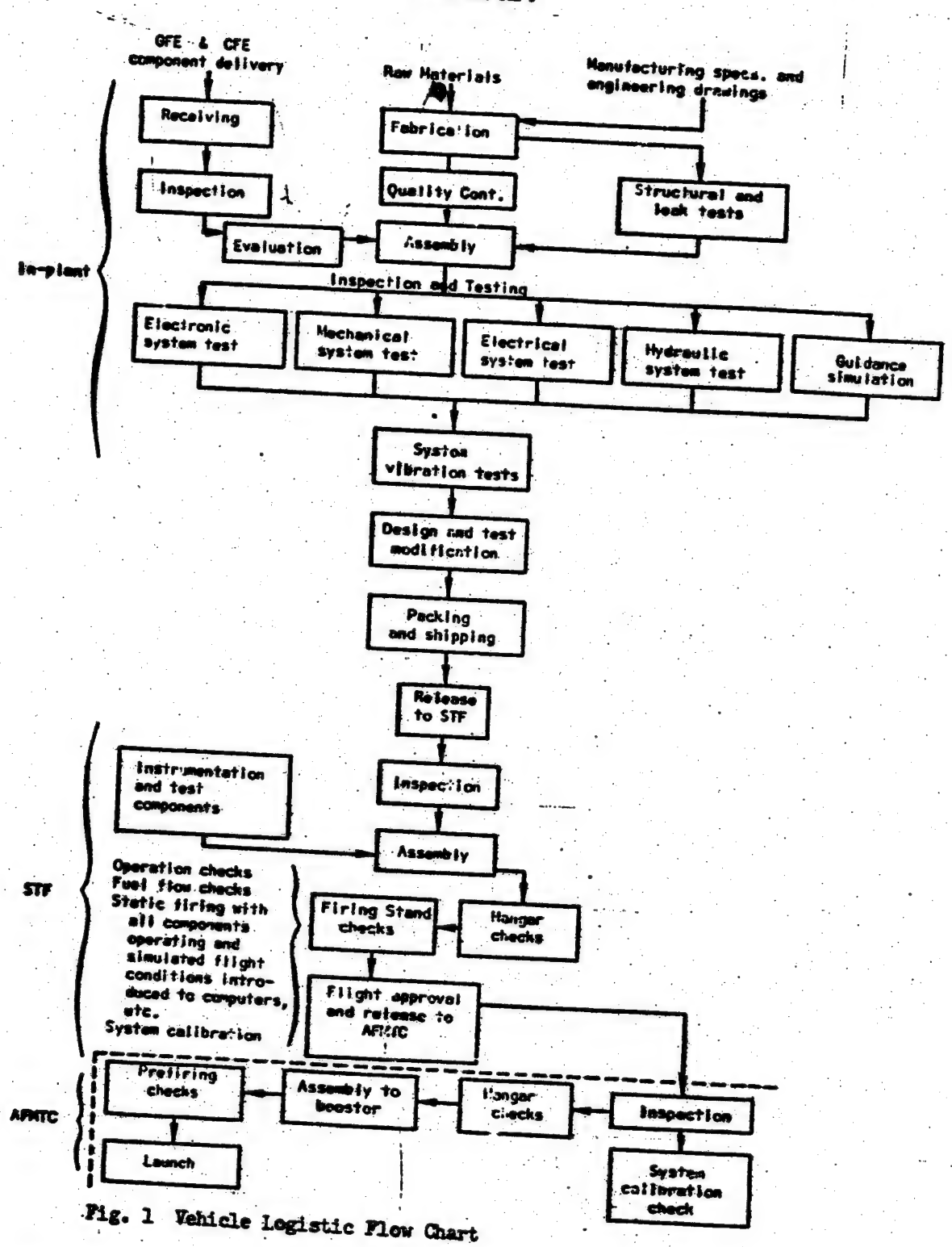

Fig. 1 Vehicle Logistic Flow Chart

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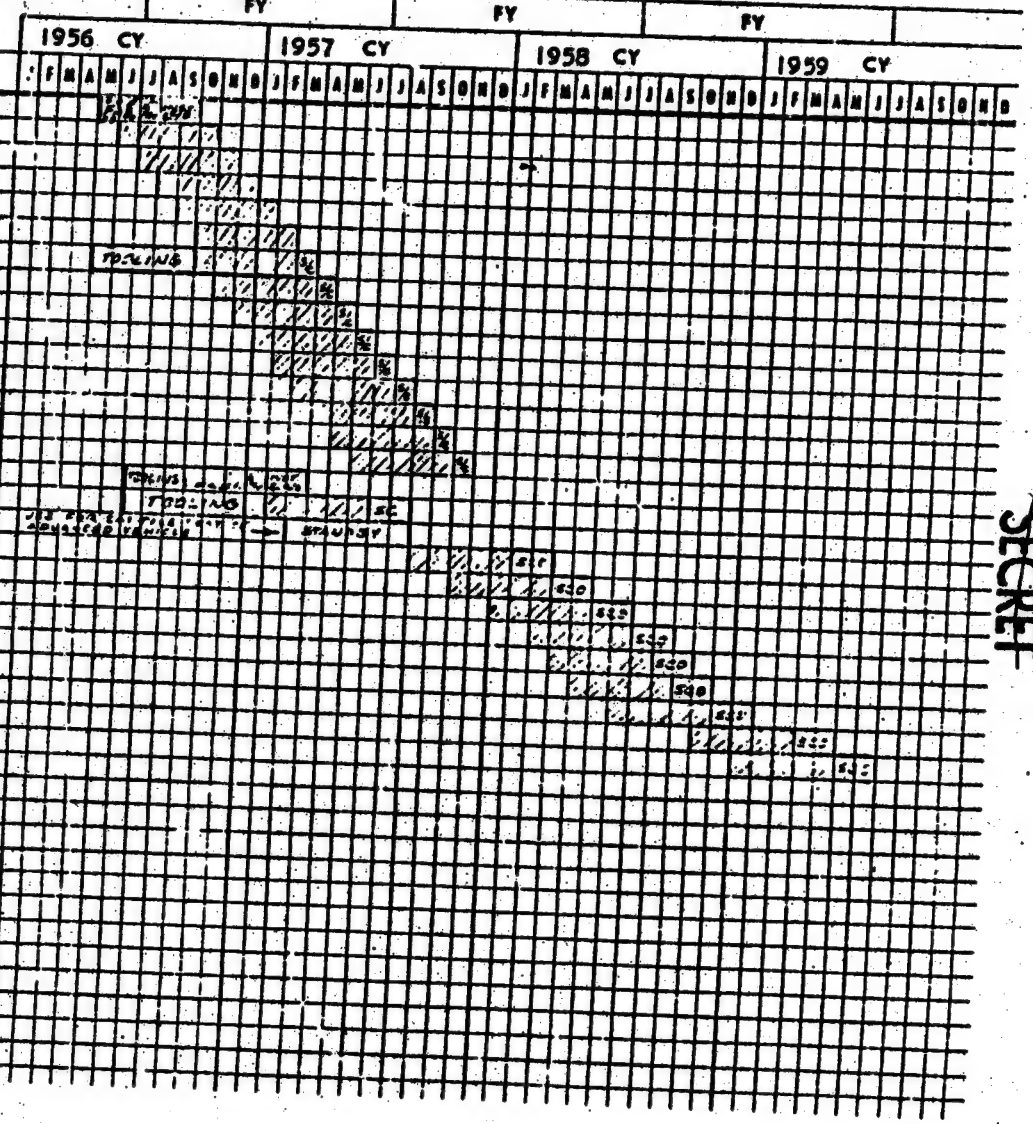
Fig. 2. (Page 1 of 5)
Proposed Manufacturing Schedule

PROGRAM NO. 1

1	System Test Vehicle	1
2	"	2
3	"	3
4	"	4
5	"	5
6	"	6
7	"	7
8	"	8
9	"	9
10	"	10
11	"	11
12	"	12
13	"	13
14	"	14
15	"	15
16	Dog Bird	1
17	Captive Test	1
18	"	2
19	Non-Orbiting Test Veh.	1
20	"	2
21	"	3
22	Orbital Test Vehicle	1
23	"	2
24	"	3
25	"	4
26	"	5
27	"	6



S/C, SC, SCO ~ Shipping and Checkout

~ Fabrication

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Fig. 2. (Page 2 of 5)
Proposed Manufacturing Schedule

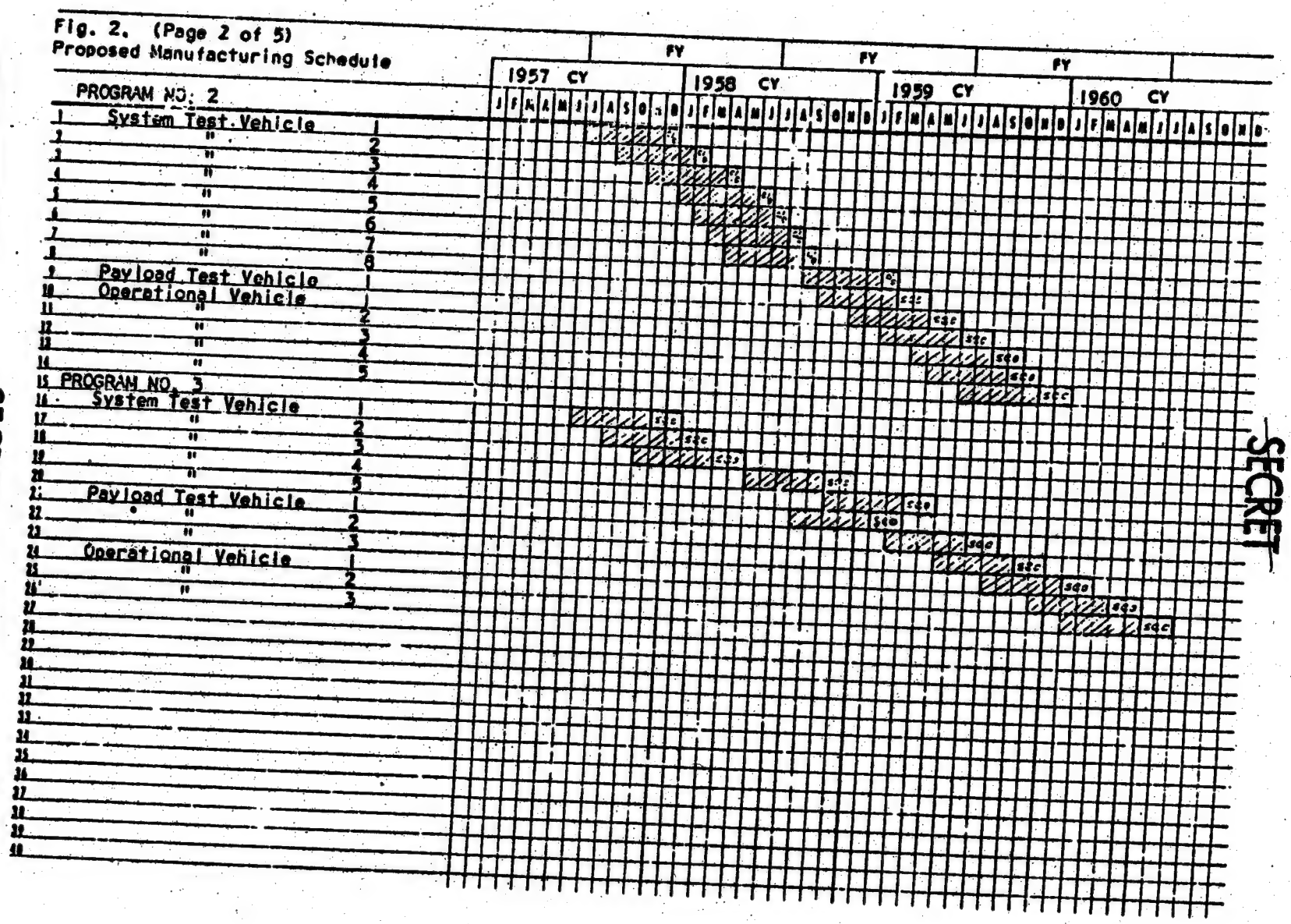

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Fig. 2. (Page 3 of 5)
Proposed Manufacturing Schedule

PROGRAM NO. 4

1	Dog Bird	2
2	System Test Vehicle	1
3	Redesign Captive 2 for Advanced Veh.	
4	System Test Vehicle	2
5	"	3
6	"	4
7	Payload Test Vehicle	1
8	"	2
9	Operational Vehicle	1
10	"	2
11	"	3
12	"	4
13	"	5

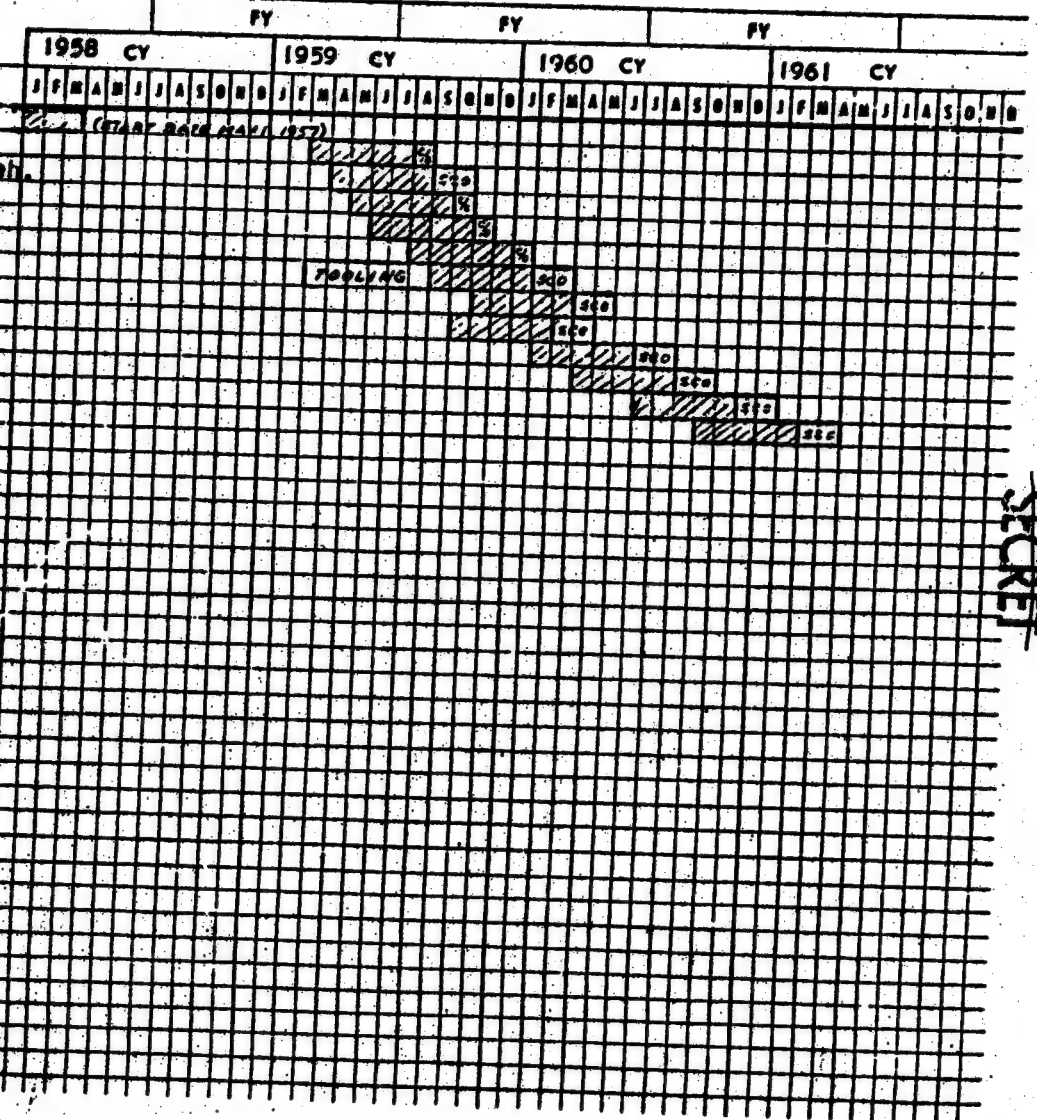

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Fig. 2. (Page 4 of 5)
Proposed Manufacturing Schedule

PROGRAM NO. 5

1	System Test Vehicle	1
2	"	2
3	Payload Test Vehicle	1
4	Operational Vehicle	1
5	"	2
6	"	3
7	"	4
8	"	5

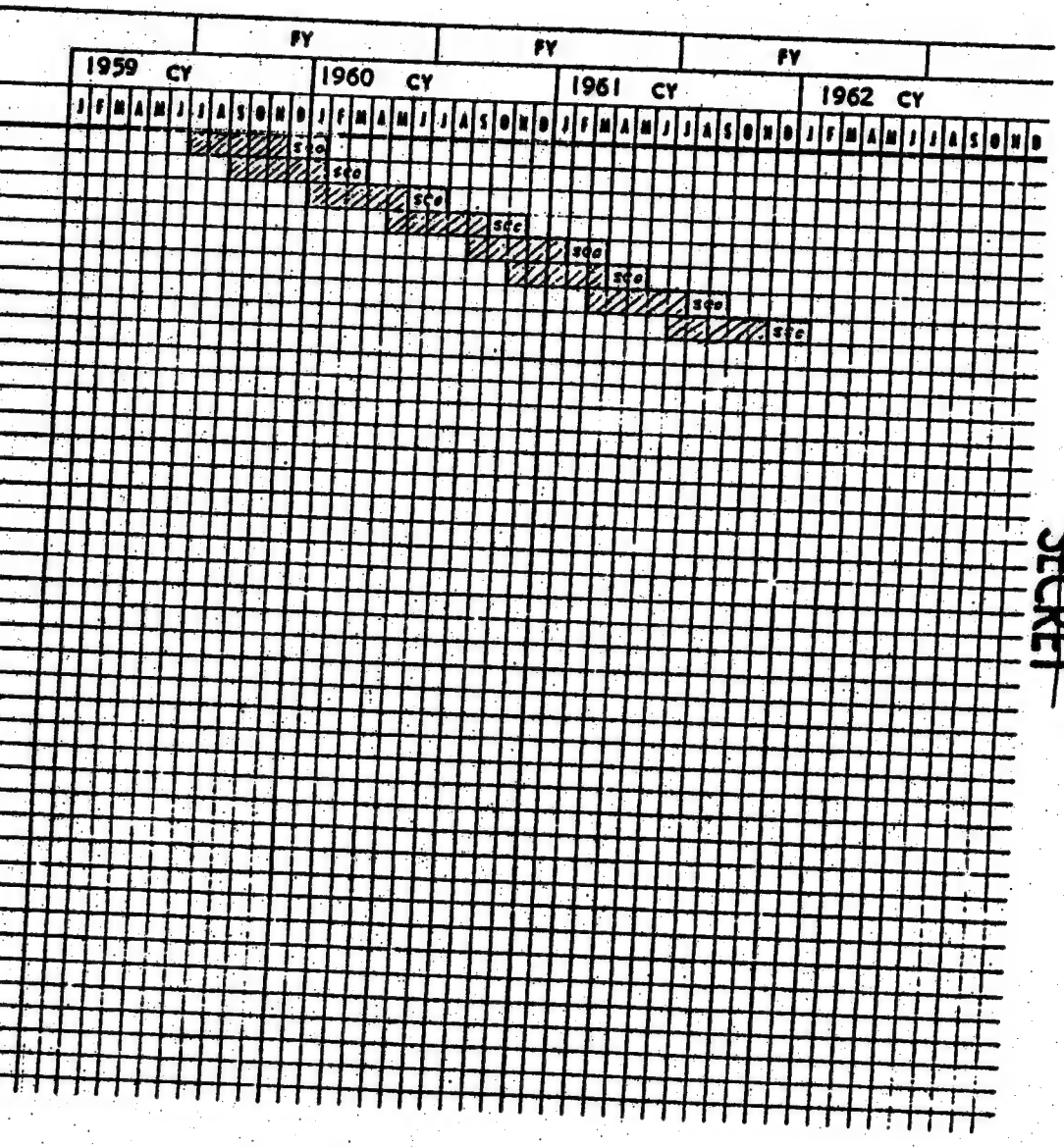

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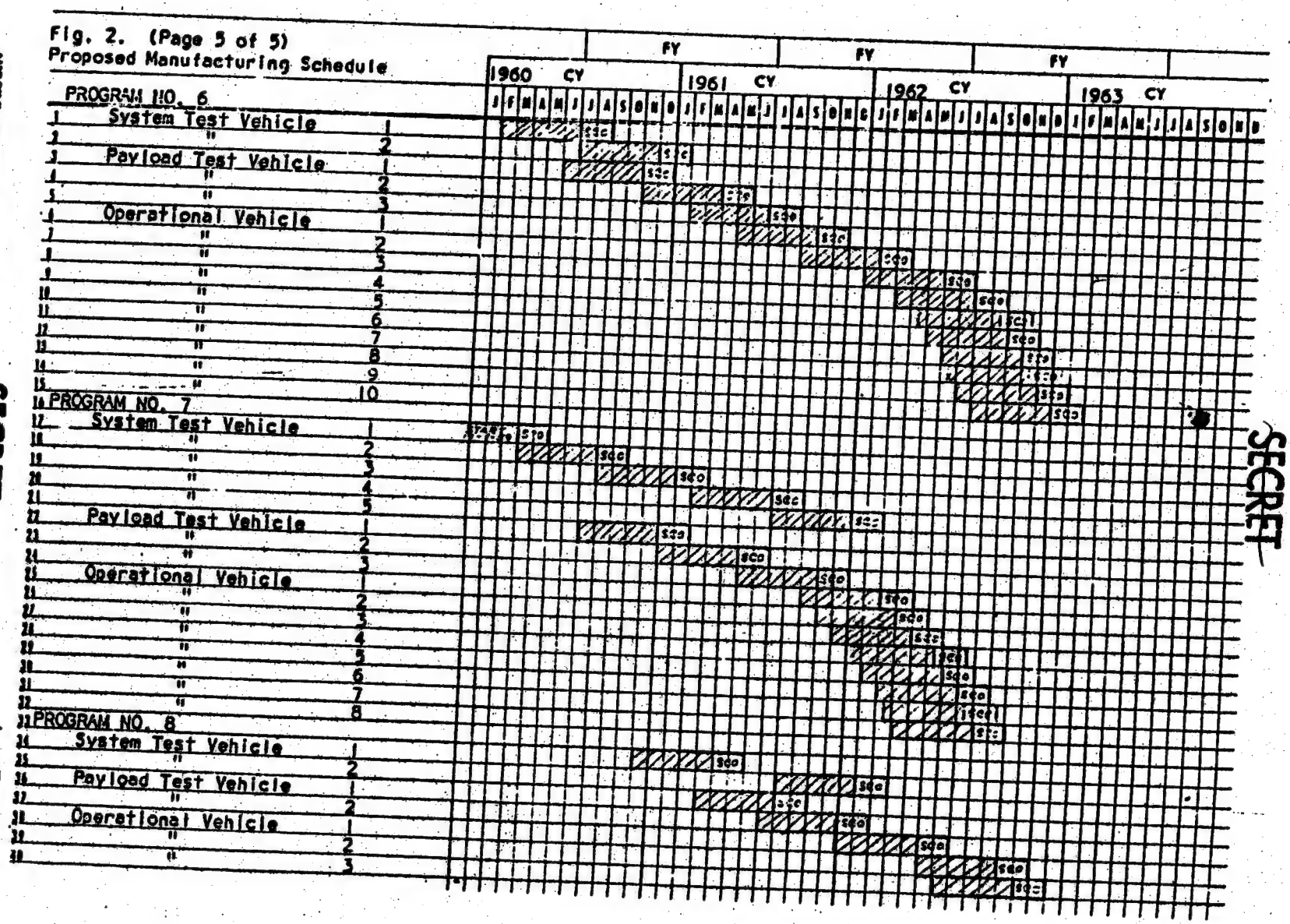
Fig. 2. (Page 5 of 5)
Proposed Manufacturing Schedule



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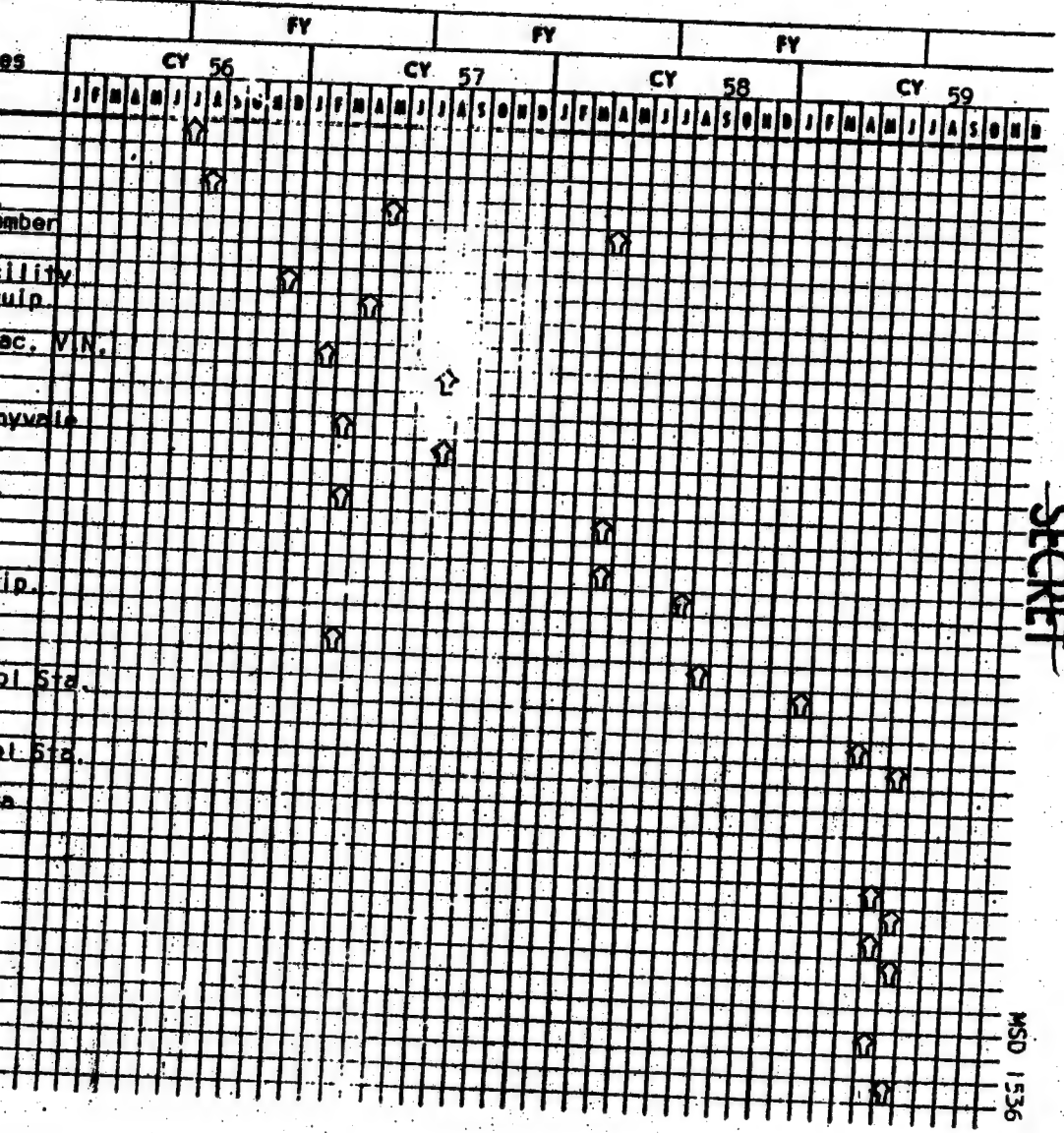
Subsystem L - VEHICLE GROUND SUPPORT

Tab 2 Summary - Subsystem Milestones



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Subsystem L - VEHICLE GROUND SUPPORT

Tab 2 Summary - Hardware Delivery *

	FY			
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	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D

1
2
3 * Refer to proposed manufacturing
4 schedules. Hardware Delivery of
5 each vehicle follows in month
6 immediately after fabrication period
7
8 Flight test date follows in month
9 immediately after shipping & check
10 out period.
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Revised Form 103

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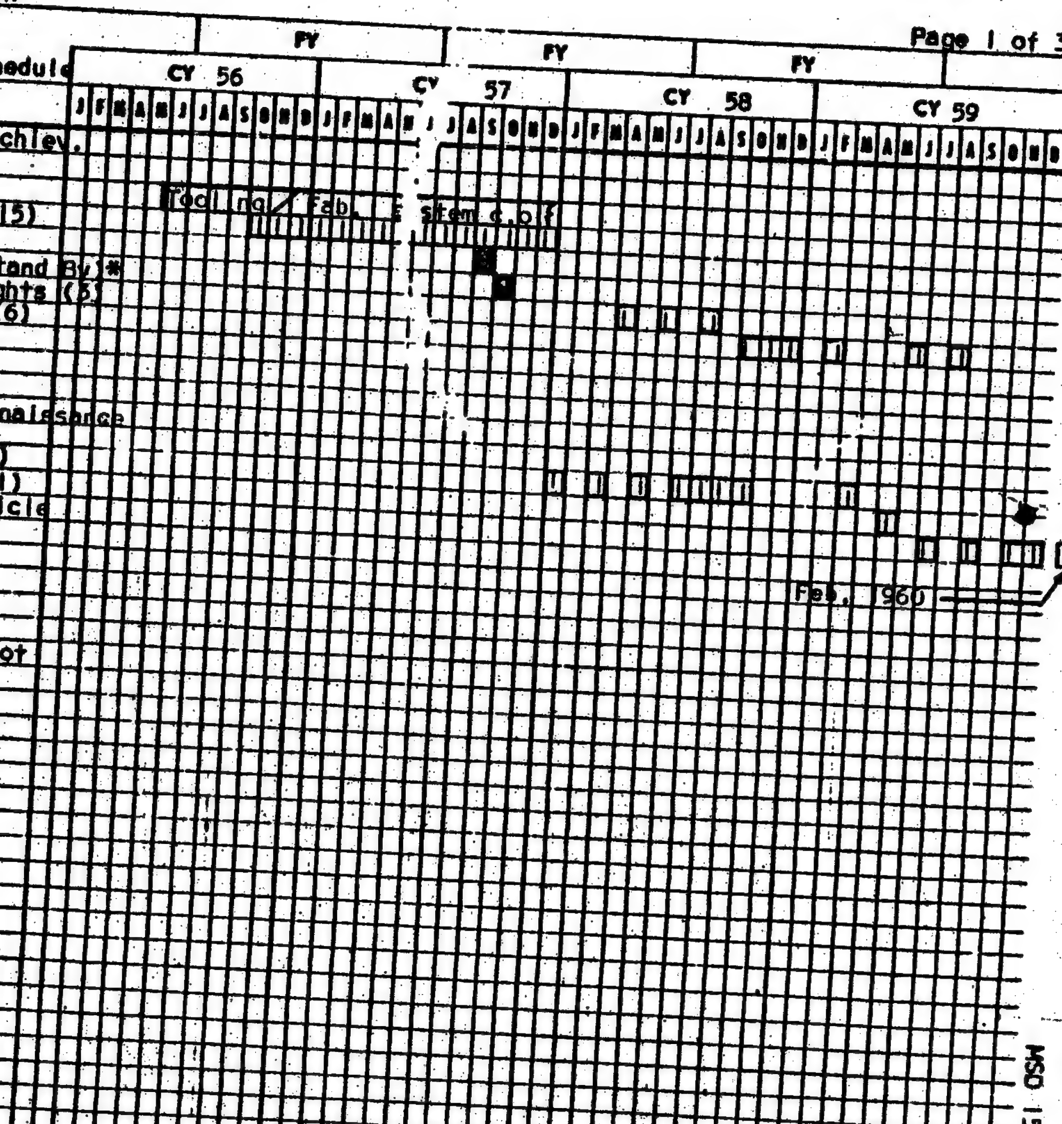
Tab 2 Summary - Subsystem Test Schedule

1 Program I - Orbital Capability Achiev.
2
3 Dog Bird No. 1
4 System Test Vehicle Flights (15)
5 Captive Test Vehicle No. 1
6 Captive Test Vehicle No. 2 (Stand By)*
7 Non-Orbiting Test Vehicle Flights (3)
8 Orbital Test Vehicle Flights (6)
9
10
11
12 Program II - Pioneer Visual Reconnaissance
13
14 System Test Vehicle Flights (8)
15 Payload Test Vehicle Flights (1)
16 Operational Prototype Test Vehicle
Flights (5)



* Captive test vehicle No. 2 if not required will be re-built for captive test program IV

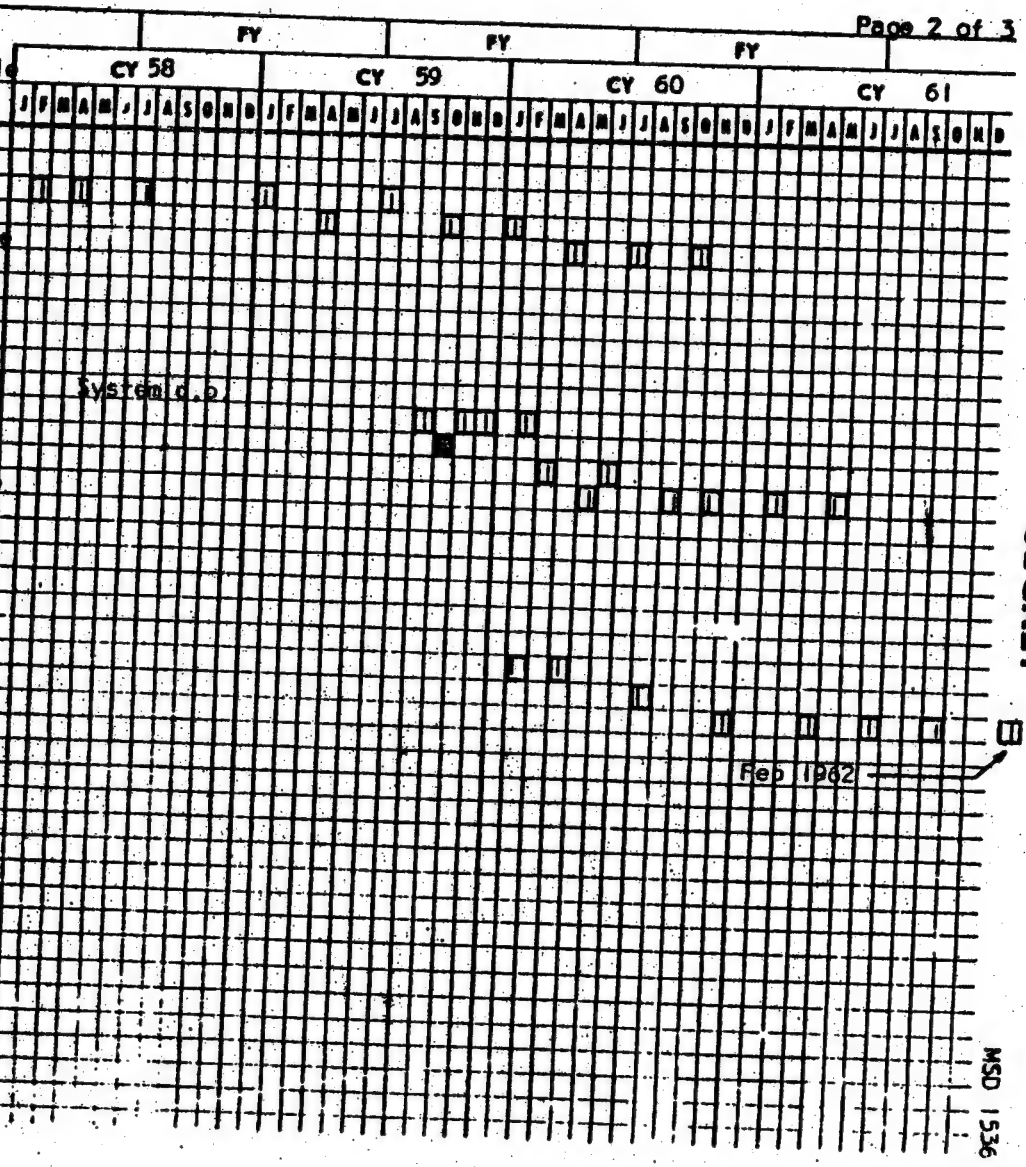
SECRET

MSD 1536

Revised Form 103

Subsystem L - VEHICLE GROUND SUPPORT

Tab 7 Summary - Subsystem Test Schedule (Continued)



1 Program III - Pioneer Ferret
2
3 System Test Vehicle Flights (5)
4 Payload Test Vehicle Flights (3)
5 Operational Prototype Test Vehicle
6 Flights (3)
7
8
9 Program IV - Large Scale Visual
10
11 Dog Bird No. 2 Start May 1957
12 System Test Vehicle Flights (4)
13 Captive Test Vehicle No. 2
14 Payload Test Vehicle Flights (2)
15 Operational Prototype Test Vehicle
16 Flights (5)
17
18
19
20 Program V - Advanced Ferret
21
22 System Test Vehicle Flights (2)
23 Payload Test Vehicle Flights (1)
24 Operational Prototype Test Vehicle
25 Flights (5)
26
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28
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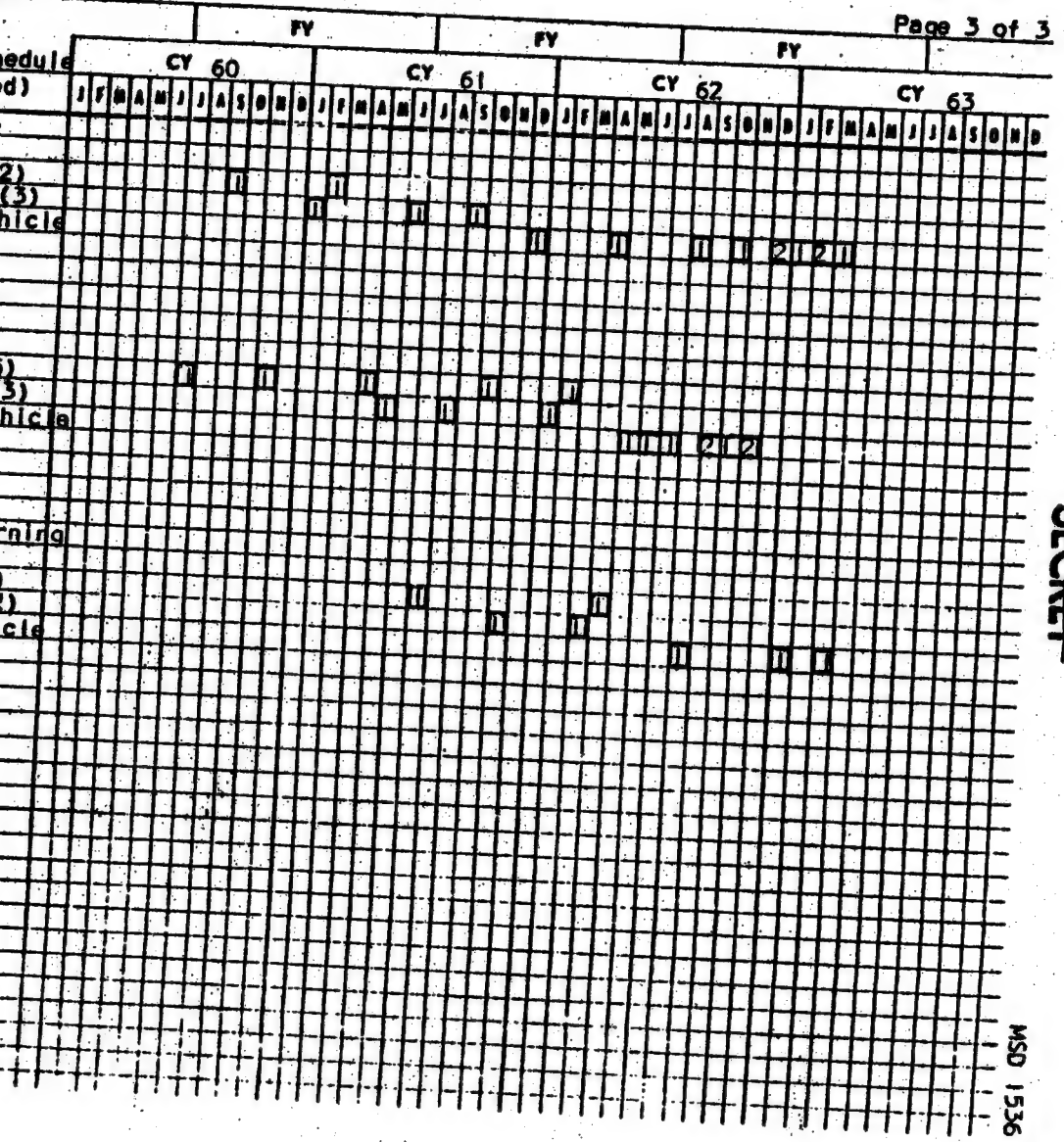
40

Revised Form 103

SECRET
SECRET

Subsystem L - VEHICLE GROUND SUPPORT

Tab 2 Summary - Subsystem Test Schedule (Continued)

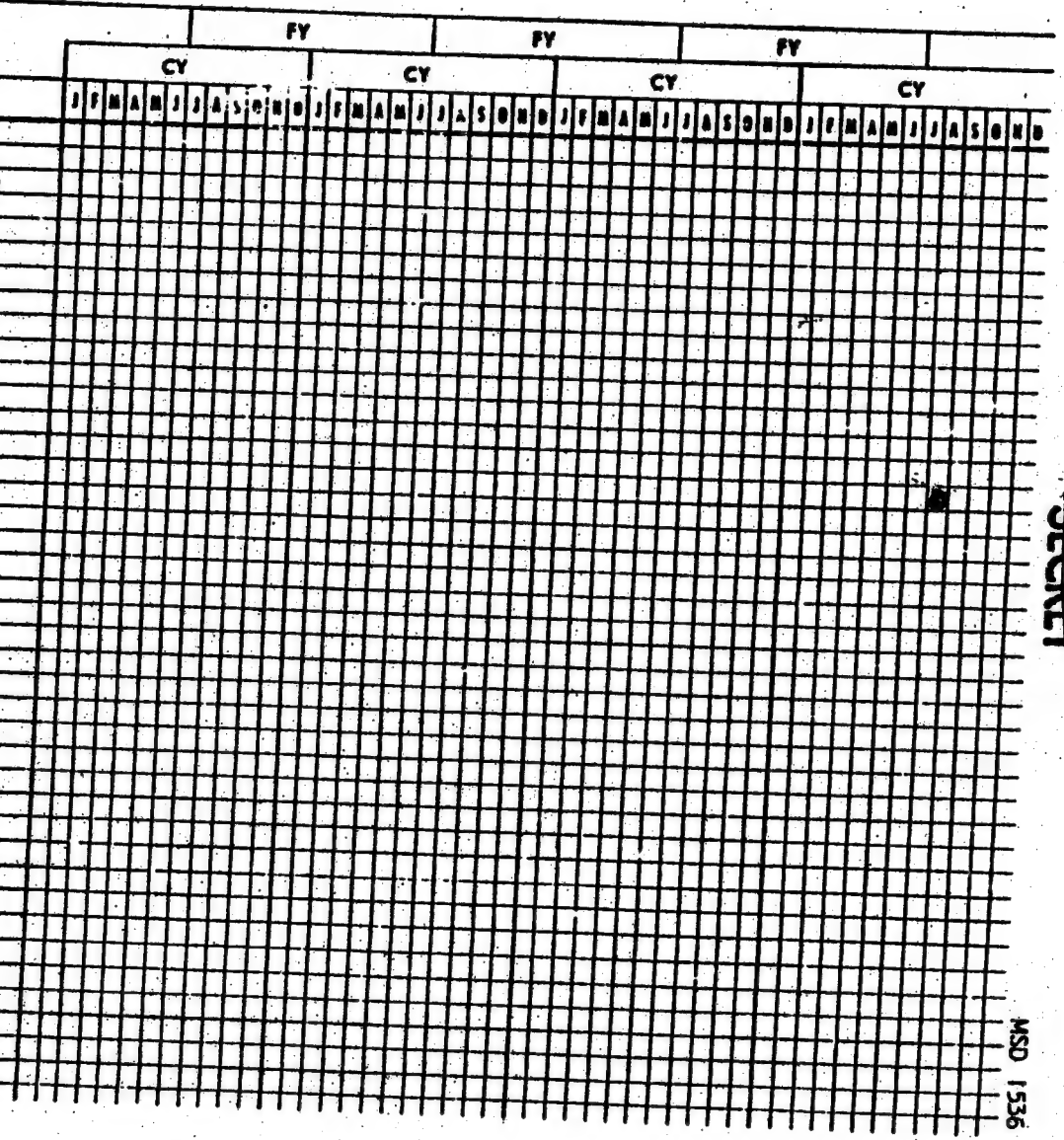


SECRET

Subsystem L - VEHICLE GROUND SUPPORT

Tab 2 Summary - R & D Schedule

The R & D Program for the Vehicle Ground Support Subsystem will be Specified at a later date.



SECRET

Revised Form 103

MISSILE SYSTEMS DIVISION

SECRET

1.

R & D TEST ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE | OF | PAGES

3. DATE: 1 March 1956

4. TITLE: Subsystem L - VEHICLE GROUND SUPPORT

5. INITIAL ☒ CHANGE

6. NUMBER

7. RESP CENTER

8. PROJECT OFFICER

9. SUPPORTS (Sys or Proj)

10. CONTRACTOR

11. CONTR NR

12. PRIORITY AND PREC

13. SECURITY

14. ITEM NUMBER	15. TEST ITEM	16. TEST DESCRIPTION	17. TEST AGENCY AND SITE	18. TEST ITEM AVAILABLE	19. RDD TEST COMPL DATE
1	STV (43)	Systems tests and flight compatibility tests	AFMTC - GFF	Oct 1956	Apr 1962
2	NOTV (7)	Full Scale Non-Orbit tests	AFMTC - GFF	Sep 1957	Apr 1958
3	OTV (6)	Full Scale Orbit Tests	AFMTC - GFF	Jun 1958	Mar 1962
4	PTV (15)	Full Scale Payload Test	AFMTC - GFF	Apr 1959	Mar 1962
5	OPT (39)	Full Scale Operational Flights	Alternate Launching Site-GFF	Jul 1959	Mar 1963

TEST CENTER APPROVAL

20. NAME | ORGANIZATION | DATE

21. NAME | ORGANIZATION | DATE

RESPONSIBLE CENTER APPROVAL

22. NAME | ORGANIZATION | DATE

ARDC FORM 1 JUL 55 105 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

L - Tab 3, p 1

LOCKHEED AIRCRAFT CORPORATION

SECRET

MSD 1536

MSD 1536

1.

R & D TEST AND TEST SUPPORT AIRCRAFT ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE | OF | PAGES

3. DATE: 1 March 1956

4. TITLE: Subsystem L - VEHICLE GROUND SUPPORT

5. INITIAL ☐ CHANGE

6. NUMBER

7. ITEM NUMBER	8. AIRCRAFT REQUIRED QTY	TYPE, MODEL AND SERIES	SERIAL NUMBER	9. ASG CODE	10. MOD REQD	11. DATE REQD AND LOCATION	12. ESTIMATED RELEASE DATE	13. RECOMMENDED DISPOSITION	14. FHRS. F CST	15. EST COST
		SUMMARY OF AIRCRAFT SPECIFIED FOR SUBSYSTEM TESTING								
1.	1	B 50			x	1 Jan'57 Van Nuys	Oct'60		2500	
2.**	1	B 50			x	June'57	Jan'61		1500	
3.	1	Doman Helicopter			x	Aug'56	Jan'57		500	

** Item No. 2 will serve as back up aircraft.

* The extent of modification required is not known now, but will be indicated in the bailment agreement.

ARDC FORM 1 JUL 55 106 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

L - Tab 4, p 1

SECRET

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 1 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor administrative equipment requirements at AFMTC

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Columns Form using Columns as cited in Examples)

Qty	Nomenclature	Cost	Year
35	Desk - Office at $85	$2,975	(18) 1956 (17) 1957
35	Chairs - Desk at $40	1,400	(18) 1956 (17) 1957
15	Cabinet - File at $95	1,425	(9) 1956 (6) 1957
2	Typewriters (Electric) at $.)	740	(1) 1956 (1) 1957
6	Typewriters (Standard) at $140	840	(4) 1956 (2) 1957
3	Calculating Machine at $455	2,165	(1) 1956 (2) 1957
1	Duplicating Machine	750	1956
	Support Items (Lockers, waste baskets, bookcases, etc.)	1,000	1956
	TOTAL	$11,295	

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

MSD 1536

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 2 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor leased equipment requirements
for AFMTC - Mechanical

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Columnar Form using Columns as cited in Examples)

Nomenclature	Cost	Year Req'd.
Shop type machinery such as:		
Lathe, Drill Press, Grinder, Welding Equipment		
Saw, shear, sander, flaring machine, work benches,		
vises, gages, etc. - - - - - - - - at $5,000/yr. (LEASED)		
	$ 2,500	1956(6 mo.)
	5,000	1957
	5,000	1958
	5,000	1959
TOTAL	$17,500	

ARDC FORM 1 JUL 55 187 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

MISSILE SYSTEMS DIVISION

LOCKHEED Aircraft Corporation

SECRET

SECRET

MSD 1536

SECRET

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 3 OF 13 PAGES

3. DATE 1 March 1956

4. NUMBER

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor equipment requirements for AFMTC-Electrical and Electronic

5. INITIAL ☐ CHANGE

7. MATERIEL REQUIREMENTS (Indicate Items in Columns Four and Columns as cited in Examples)

Qty	Nomenclature	Cost	Year Req'd
1	Checkout Console	$ 25,000	1956
*1	Mobile Ground Station	15,000	1957
*	Ground Station Equipment	125,000	1957
		$165,000	

* Equipment required to supplement existing capital equipment

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

MSD 1536

SECRET

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

3. DATE: 1 March 1956

4. TITLE: Subsystem L - VEHICLE GROUND SUPPORT
Contractor ground handling and Vehicular requirements at AFMTC

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate items in Columnar Form using Columns as cited in Examples)

Qty	Nomenclature		Cost	Year Req'd
1	Erecting Trailer at $30,000	(STV)	$30,000	(1) 1956
1	Erecting Trailer at 45,000	(OTV)	45,000	(1) 1957
1	Truck (1½ ton)		3,200	1956
4	Truck (½ ton) at 1,500		6,000	(2) 1956 (2) 1957
1	Forklift (4000 # cap)		5,700	1956
		TOTAL	$89,900	

ARDC FORM 1 JUL 55 167 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

SECRET

1. R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 5 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor Special equipment requirements at AFMTC

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Chronological Form using Columns as cited in Examples)

Nomenclature	Cost	Year Req'd
Safe handling equipment for installation and transport of hazardous closed chemical and nuclear APU Systems	$75,000	1958
TOTAL	$75,000	

ARDC FORM 1 JUL 55 187 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

MSD 1536

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 6 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor Special Equipment Requirements at Alternate Launching

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate items in Columnar Form using Columns as cited in Examples)

Nomenclature	Cost	Year Req'd
Safe handling equipment for installation and transport of hazardous closed chemical and nuclear APU Systems	$75,000	1959
TOTAL	$75,000	

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 7 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor ground handling and Vehicular requirements at Alternate Launching

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Columns Form using Columns as shown in Examples)

Qty	Nomenclature	Cost	Year Req'd
1	Erecting Trailer at $45,000	$45,000	1959
1	Truck (1½ ton)	3,200	1959
4	Truck (½ ton) at $ 1,500	6,000	1959
1	Forklift (4000 # cap)	5,700	1959
	TOTAL	$59,900	

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

MSD 1536

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 8 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor administrative equipment requirements at Alternate Launching Site

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Columns Form using Columns as cited in Examples)

Qty	Nomenclature	Cost	Year
35	Desk - Office at $85	$ 2,975	1959
35	Chairs - Desk at $40	1,400	1959
15	Cabinet - File at $95	1,425	1959
2	Typewriters (Electric) at $370	740	1959
6	Typewriters (Standard) at $140	840	1959
3	Calculating Machine at $455	2,165	1959
1	Duplicating Machine	750	1959
	Support Items (Lockers, waste baskets, bookcases, etc.	1,000	1959
	TOTAL	$11,295	

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

MISSILE SYSTEMS DIVISION

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 9 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor equipment requirements for
Alternate Launching Site - Mechanical

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Columnar Form using Columns as cited in Examples)

Nomenclature	Cost	Year Req'd
Shop type machinery such as:		
Lathe, Drill Press, Grinder, Welding Equipment, Saw, shear, sander, flaring machine, work benches, vises, gages, etc. - - - - - - - - - - - - - - - -	$20,212	1959

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

LOCKHEED AIRCRAFT CORPORATION

1 - Tab 5 p 9

MSD 1536

SECRET

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 10 OF 12 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
Contractor equipment requirements for Alternate Launching Site - Electrical & Electronic

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Items in Columnar Form using Columns as titled in Examples)

Qty	Nomenclature	Cost	Year Req'd
1	Checkout Console	$ 25,000	1959
1	Mobile Ground Station	40,000	1959
	Ground Station Equipment	200,000	1959
	TOTAL	$265,000	

ARDC FORM 1 JUL 53 187 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

MSD 1536

SECRET

MISSILE SYSTEMS DIVISION

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 11 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT In Plant Modification Center

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate items in Columnar Form using columns as cited in Examples)

ADDITIONAL MATERIAL REQUIRED:

	Cost	Year
Electronic equipment and special checkout equipment	$ 55,000	1957
Shop Facilities and Tools	12,000	1957
Handling Equipment **	10,000	1957
Guidance Console	120,000	1957
New Ground Station (if split facility at Van Nuys and Sunnyvale)	110,000	1957

** Requirement subject to correlation with existing vehicle programs

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

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LOCKHEED AIRCRAFT CORPORATION

MSD 1536

MISSILE SYSTEMS DIVISION

SECRET

LOCKHEED AIRCRAFT CORPORATION

1.

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 12 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT
In Plant Environmental Test Facility

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate items in Columnar Form using Columns as cited in Examples)

ADDITIONAL EQUIPMENT REQUIRED (See assumptions under "Remarks")

	Cost	Year
Two week uninterrupted tests (heat, refrig., altitude, radiation, etc.)	$200,000	1957
Component Tests (Shock, accel., vibration, etc.)	100,000	1956
High Capacity Altitude Chamber (Rapid change in conditions)	150,000	1958
Structure Testing (Hot and cold, tensile, etc.)	100,000	1957
Tools and Supporting Equipment	20,000	1956
Material Tests (Chemistry, heat, fuels, etc.)	100,000	1957/1958
Materials (Yearly)	25,000	
Maintenance (Yearly)	25,000	

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

MSD 1536

R & D MATERIEL ANNEX

☐ SYSTEM ☒ PROJECT ☐ TASK ☐ OTHER

2. REPORTS CONTROL SYMBOL

PAGE 13 OF 13 PAGES

3. DATE 1 March 1956

4. TITLE Subsystem L - VEHICLE GROUND SUPPORT System Test Facility

5. INITIAL ☐ CHANGE

6. NUMBER

7. MATERIEL REQUIREMENTS (Indicate Name in Columns Provided and Columns as cited in Examples)

Vehicle & Propulsion Test		
Blockhouse, 4 cells, fire and water	500,000	1956
*Equipment, furniture, safety, shop, etc.	150,000	1956
Fuel support and safety $(CH_3)_2N_2H_2$ and HNO_3 - NO_2 - disposal	350,000	1956
*Altitude Chamber (missile) environmental	550,000	1958
Component and Hazard Test		
*Building, fire, cells, controls and water	100,000	1956
Fuel Support (APU) and new development	15,000	1956
*Equipment, furniture, safety, shop, etc.	75,000	1956
Altitude Chambers and pumps (APU) Life Test	150,000	1957
Instrumentation and Data Facility		
Building, Office, Shop, furniture	175,000	1956
*Instruments - 150 channels	550,000	1957/1958
Maintenance (Yearly)	185,000	
Expansion (Hazard Fuel) - New Location**		
Land (100 acres)	300,000	1957/ 958
Roads, fire equipment, drainings	175,000	
Office, Hospital, Support, etc.	125,000	
*Missile Test (Some salvage from Sunnyvale)	700,000	
*Component Test(Some salvage from Sunnyvale)	100,000	
*Instrumentation (Some salvage from Sunnyvale)	600,000	

**The following equipment and facility will be required for installation at an isolated area in the event a fluorine propulsion system is injected into the program at a later date.

ARDC FORM 1 JUL 55 107 PREVIOUS EDITIONS OF THIS FORM ARE OBSOLETE.

SECRET

SUBSYSTEM L - VEHICLE GROUND SUPPORT
This facility will be supported by the following subsystems:
A. Airframe, B. Propulsion, C. APS, D. Guidance and Control, E. Vehicle Electronics

DATE 1 March 1956

LOCATION: Van Nuys, California

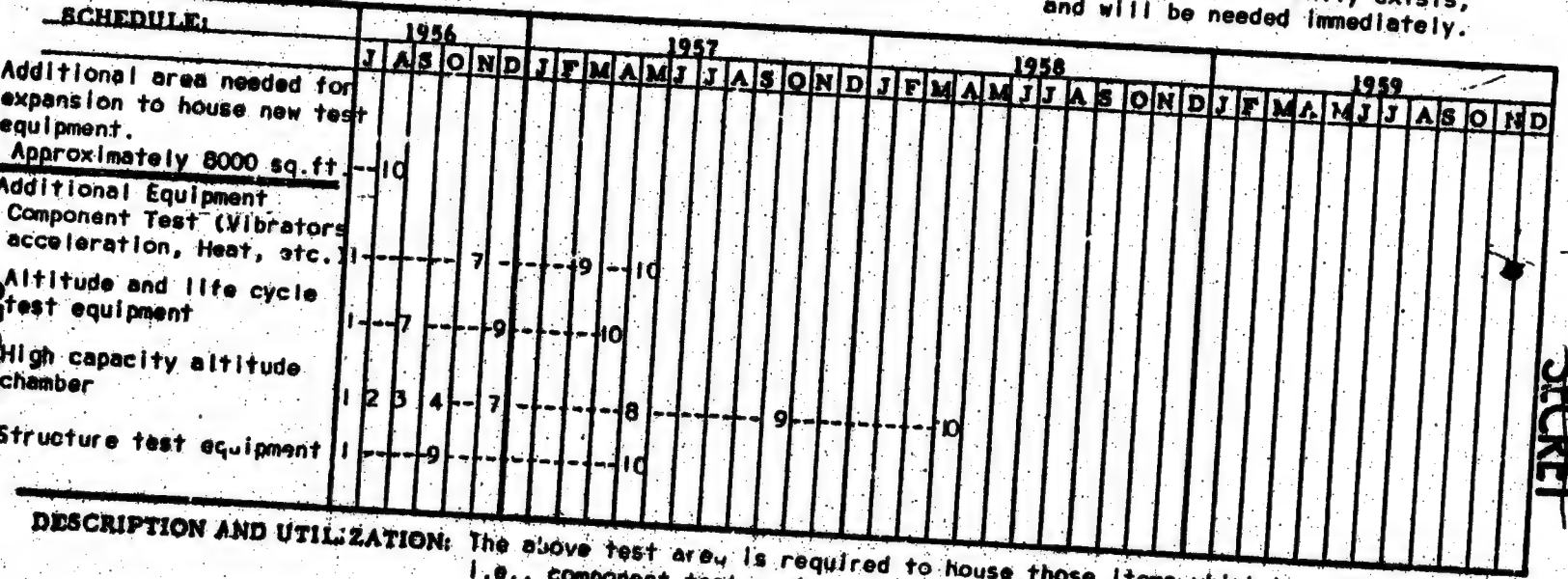
ITEM: MSD "in plant" test facility

BUDGET CONTROL ESTIMATE: $10,000 *

USING AGENCY: Lockheed Missile Systems Division

NEED DATE: This facility currently exists, and will be needed immediately.

SCHEDULE:



DESCRIPTION AND UTILIZATION: The above test area is required to house those items which have been delineated i.e., component test equipment, altitude test equipment and altitude chamber.

* Cost of area modification for wiring, storage, preparation of floor and ceiling.

REMARKS: * Individual laboratories for testing currently exist at Van Nuys. In event of a move to Sunnyvale, these laboratories will move intact. Programming of tests will be such that none will be interrupted. Procurement of additional specialized equipment will continue and phased in delivery to proper location.
See following pages for additional information.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

MSD "IN PLANT: ENVIRONMENTAL TESTING FACILITY

I. PURPOSE

In plant test facilities will provide services to duplicate, if possible, "in-flight" conditions. Research, development and engineering reliability tests used in the design and evaluation of breadboard models of subsystems, and subsystem materials will be conducted in various existing laboratories. Existing test equipment will be supplemented and expanded as well as the addition of much specialized test equipment which will be fabricated. This facility will be contractor furnished and operated.

II. LOCATION

Current facilities exist at Lockheed Missile System Division, Van Nuys, California. Consideration has been given to the location of in plant testing facilities at Sunnyvale, California. It is anticipated that current facilities will be moved intact to the new location with no disruption of the testing schedules. Testing in progress at Van Nuys will be completed and data assimilated before such a move is activated.

III. DESCRIPTION AND JUSTIFICATION

In order to insure sufficient test equipment is available to meet the added requirements of testing for the APS, approximately 8000 square

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

feet of laboratory and testing area will be needed to house personnel and equipment. This area will be part of the "in plant" facility so that logistics problems of procuring components and material will be simplified. Equipment to be installed and employed in this testing area will consist in general of the following:

Environmental test equipment for temperature, humidity, altitude, heat and radiation cycling.

Shock, acceleration, and vibration equipment for subsystem components.

Structural

Vacuum test equipment to handle small component and breadboard system for altitude and life cycle tests.

Structural and tensile test equipment for materials, hardware, rupture and shear testing.

An additional area of 6000 sq. ft. will be needed at the "in plant" facility to conduct test of components in the vicinity of dangerous auxiliary power system exhaust and raw fuels to be used in the APU. This area will be near the "in plant" facility, but physically isolated to protect personnel and property. Additional equipment will include:

Chemical analysis equipment

Fuel spray cells

Testing and working cells

SUBSYSTEM L - VEHICLE GROUND SUPPORT
This area and Facility will be supported by all subsystems

DATE 1 March 1956

LOCATION: Sunnyvale, California

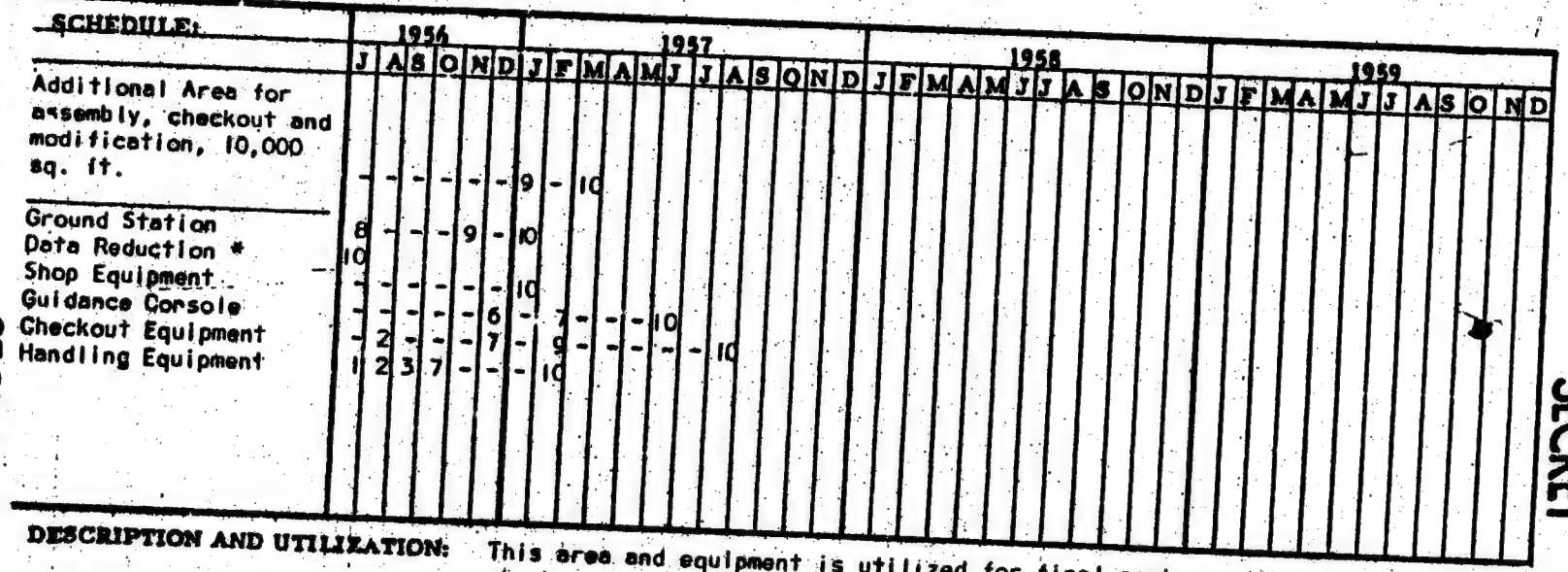
ITEM: MSD "In Plant" Modification Facility

BUDGET CONTROL ESTIMATE: ---

USING AGENCY: Lockheed Missile Systems Division

NEED DATE: January 1957

SCHEDULE:



DESCRIPTION AND UTILIZATION: This area and equipment is utilized for final system calibration, inspection checkout (hot firing) and development modification before shipment preparation.

* Data reduction at Van Nuys, California

REMARKS: Additional area necessary for classified security.
See following pages for additional information.

Revised Form 108

SECRET

SECRET

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

MSD "IN PLANT" MODIFICATION FACILITY

I. PURPOSE

In plant modification will provide services to make special modifications to a vehicle that has been fabricated as a result of component and total system testing. This will allow uninterrupted vehicle fabrication and assembly and will entail only small design changes that do not interfere with normal fabrication. This facility will be contractor furnished and operated.

II. LOCATION

A modification center currently exists at LMSD, Van Nuys, California. This center is presently saturated with modification of vehicles on other Air Force programs. It is anticipated that early modification for the System Test vehicles will be conducted at Van Nuys and phased, if possible, in the present modification center. Other plans will be necessary if the complete fabrication program remains in Van Nuys. Tentatively these plans would include an additional 10,000 sq. ft. of area for modification and checkout. In the event program fabrication is moved to Sunnyvale, California, the same requirements would exist. Proper time phasing of vehicle modification would decrease the area requirements at Van Nuys if facilities are initiated by February 1957 at Sunnyvale.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

III. DESCRIPTION AND JUSTIFICATION

In order to insure that minor design changes in fabrication, wiring and mechanical systems are integrated into the vehicles prior to shipment to the test bases a modification center is required in close proximity to the fabrication and environmental test area. This will avoid any interruption in fabrication schedules except in the cases of major design changes.

Supporting checkout and handling equipment for this center include:

Direct wire ground station

Shop equipment and tools

Guidance Console

Electronic checkout equipment

Handling equipment

Data Reduction

Regardless of the location of the modification center the data reduction will be handled by the Van Nuys facility until the entire data reduction facility and personnel are moved to Sunnyvale.

SECRET

SUBSYSTEM L - VEHICLE GROUND SUPPORT

DATE 1 March 1956

This facility will be supported by the following subsystems:
A. Airframe, B. Propulsion, C. APS, D. Electronics, E. Guidance and Control

LOCATION: Van Nuys, California

ITEM: MSD "in plant" facility (Propulsion Propellants)

BUDGET CONTROL ESTIMATE: $30,000 *

USING AGENCY: Lockheed Missile Systems Division

NEED DATE: This to supplement existing facility and will be needed immediately.

SCHEDULE:

	1956						1957												1958												1959											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Additional building for investigation of effect of dangerous propellants upon components Approx. 6000 sq. ft.	8	--	9	----		10																																				
Additional Equipment Material (chemistry, radiation, etc.)	1	2	------			9	------			10																																

DESCRIPTION AND UTILIZATION: This facility is required to house test equipment and to perform dangerous studies. The purpose is semi-isolation from large areas of personnel.

* Cost includes construction of building including wiring, plumbing, etc.

REMARKS: * This will supplement the programming of tests and developments undertaken by other laboratories. See following pages for additional information.

SECRET

Revised Form 108

SUBSYSTEM L - VEHICLE GROUND SUPPORT
This area and Facility will be supported by all subsystems

DATE 1 March 1956

LOCATION: Van Nuys, California

ITEM: MSD "IN PLANT" Modification Facility

BUDGET CONTROL ESTIMATE: 50,000 *

USING AGENCY: Lockheed Missile Systems Division

NEED DATE: This area to supplement existing facility

SCHEDULE:

	1956						1957												1958												1959											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Additional area or building for expansion to house new equipment and modification. Final preparation 10,000 sq. ft	-	-	9	-	-	-	-	10																																		
Ground Station	9	10																																								
Data Reduction	10																																									
Shop Equipment	-	-	-	9	-	-	10																																			
Handling Equipment	1	2	3	7	-	-	-	10																																		
Guidance Console	-	-	-	-	-	6	-	7	-	-	10																															
Checkout Equipment	-	2	-	-	-	7	-	9	-	-	-	-	-	10																												

DESCRIPTION AND UTILIZATION: This area and equipment is utilized for final system calibration, inspection, checkout (no hot firing) and development modifications before shipment preparation.

* Additional building to house vehicles and supplement operations.

REMARKS: The existing modification and assembly area will be expanded to properly service this project and provide additional security.
See following pages for additional information.

Revised Form 108

SECRET

SUBSYSTEM L - VEHICLE GROUND SUPPORT

DATE 1 March 1956

This facility will service all subsystems providing in flight tests while statically ground retained. The propulsion and auxiliary power subsystems will be tested at this facility.

LOCATION: Sunnyvale, California

ITEM: System Test Facility

BUDGET CONTROL ESTIMATE: $2,620,000

USING AGENCY: Lockheed Aircraft Corporation
Missile Systems Division

NEED DATE: January, 1957

SCHEDULE:

	1956						1957												1958												1959											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Vehicle and Propulsion Test	1	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10																				
Blockhouse & pads	5	6	-	-	7	-	9	-	10																																	
Equipment	-	3	-	-	7	-	9	-	10																																	
Fuel Support	-	3	7	-	-	-	9	-	10																																	
Altitude & Environmental Chamber	1	-	-	-	-	3	-	5	6	-	-	7	-	-	-	-	-	-	9	-	-	10																				
Component and Hazard Test	1	-	-	-	-	9	-	-	-	-	-	-	10																													
Building	5	7	-	-	9	-	10																																			
Equipment	-	3	7	-	-	-	-	9	-	-	-	-	10																													
Instrumentation and Data	1	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10																				
Building	3	-	7	-	-	-	9	10																																		
Instruments	5	8	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	10																				

DESCRIPTION AND UTILIZATION: This facility will test complete vehicles under "in flight" conditions while ground retained. Hazard and propulsion tests will be performed under control conditions including auxiliary power units, subjected to various radiation effects.

REMARKS:* This facility being a hazard and security unit will be given careful scheduling and design evaluation.
See following pages for additional information

SECRET

Revised Form 108

SUBSYSTEM L - VEHICLE GROUND SUPPORT

DATE 1 March 1956

ITEM: This facility will provide service for all subsystems providing in flight tests while statically ground retained. The propulsion auxiliary power subsystems and hazard material (chemistry tests will be at this facility.

LOCATION: To be determined at an advanced date

BUDGET CONTROL ESTIMATE: $2,000,000 (See Remarks)

USING AGENCY: System Test Facility (Hazard)
Lockheed Aircraft Corporation
Missile Systems Division

NEED DATE: Mid 1959

SCHEDULE:

	1957						1958												1959												1960											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Land Support	2																																									
Buildings	3	5	-	8	-	9	-	-	10																																	
Equipment	3	5	7	-	-	9	-	-	-	10																																
Vehicle and Propulsion	-	5	-	-	-	-	-	-	-	-	-	-	-	10																												
Blockhouse and Pads	-	-	8	-	-	-	-	-	-	9	-	-	-	10																												
Equipment	-	-	-	8	-	-	-	-	-	-	10																															
Fuel Support	-	-	-	8	-	-	-	-	-	-	-	10																														
Altitude Chamber*	7	-	-	-	-	-	-	-	-	-	9	-	-	10																												
Component and Hazard	-	5	-	-	-	-	-	-	-	-	10																															
Building	-	-	8	-	-	9	-	10																																		
Equipment	-	-	8	-	-	-	-	9	-	-	10																															
Instrumentation & Data	-	5	-	-	-	-	-	-	-	-	-	-	-	10																												
Building	-	-	8	-	-	-	9	-	10																																	
Instruments	-	-	8	-	-	-	-	9	-	-	-	-	-	10																												

DESCRIPTION AND UTILIZATION: This facility which will be almost a duplication of the Sunnyvale Facility will be devoted to the additional problem of testing with hazardous liquids such as fluorine. The prime requirement will be an isolated location for protection in case of an accident

* Available from Sunnyvale Facility schedule.

REMARKS: * This Facility will be required if the Advance Propulsion program is activated. Consolidation with the existing system test facility will be undertaken. See following pages for additional information.

Revised Form 108

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

SYSTEMS TEST FACILITY

I. Facilities are required for supporting tests of the complete vehicle system, the propulsion and apu subsystems and hazardous components. The tests will be captive tests simulating in-flight conditions wherever possible. The facilities and equipment for this testing include considerations for a hazardous testing area in a separate isolated location because of the toxic nature of advanced engine propellants. The location of the isolated testing area is undefined at this time. These facilities will be contractor furnished and operated.

II. LOCATION

Location of the System Test Facility will be Sunnyvale, California. The Hazardous System Test Facility will be in an isolated area near Sunnyvale. It is expected that the isolated requirement will not be required for total use until March, 1958. Plans will be considered later for this facility.

III. DESCRIPTION AND JUSTIFICATION

This facility is to be divided into three sections, one for vehicle and propulsion subsystem testing; one for component testing including apu's, valves, gages and controls and one for a central instrumentation data station.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

Basic vehicle system, propulsion system and complete environmental testing will be centered around a single control building. Provision for control booths, offices, shops and local fuel support control will be in this building. Four pads are planned in this area to be operated as desired. Two for vehicle testing and calibration; one for environmental, and one for system investigation.

The component and Hazard area is to be devoted to testing materials, apu's in suitable altitude chambers, propulsion system components, and electronic system elements under radiation and similar conditions. The general arrangement is to be based upon a single control building housing control booths, cells, shops and office area. The fuel support for the two areas will be designed to properly contain any fire and to suppress all toxic vapors and waste by flushing and filtration.

The central instrumentation and data facility will handle all information from the testing areas. Multiple "quick look", control data recorders and tape recorders will be provided.

An Isolated site to handle systems tests which employ such propellants as fluorine will be required at a latter date if the advanced propulsion units using fluoring are injected into the program. This facility is delineated as an isolated Hazardous test facility.

SUBSYSTEM L - VEHICLE GROUND SUPPORT
This Facility supports subsystem K. - Ground Data Processing

DATE 1 March 1956

ITEM: Advanced Reconnaissance System Intelligence Center (ARSIC)

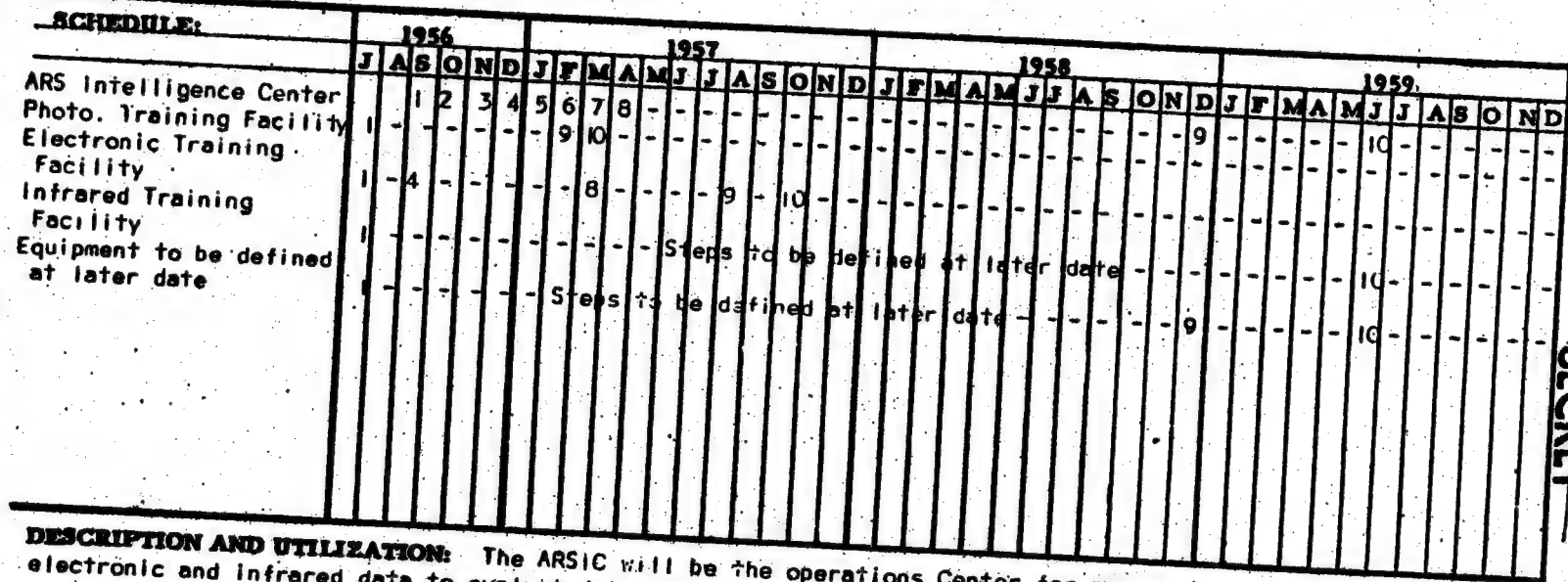
LOCATION: To be defined later

USING AGENCY: Lockheed MSD, CBS Laboratories, Eastman Kodak Co.

BUDGET CONTROL ESTIMATE: $6,150,000 *

NEED DATE:

SCHEDULE:



DESCRIPTION AND UTILIZATION: The ARSIC will be the operations Center for conversion of all ARS visual, electronic and infrared data to evaluated intelligence for Command study, planning and action. The photo training facility will require space for approximately 1800 photo interpreters, specialists and correlators. The electronic training facility will require space for approximately 1200 data analyzers and interpreters.

REMARKS: * Estimate includes $90,000 for Electronic Training Facility and $60,000 for Photo Training Facility.
See following pages for additional information.

Revised Form 108

Tab 6 - cont'd

Subsystem L - Vehicle Ground Support

ADVANCED RECONNAISSANCE SYSTEM INTELLIGENCE CENTER (ARSIC)

I. PURPOSE

The primary purpose may be stated as a solution to the problem of data handling on such a large scale that machine and manpower demands may rapidly exceed realistic values. It is essential that means be found for minimizing redundancy, for speeding up interpretation of reconnaissance information, and for acquisition of trained intelligence personnel. Three primary functions need be provided within the structure of the ARS Intelligence Center (ARSIC). These are: operation of a Visual Reconnaissance Processing Branch, Electronic Processing Branch, and an Infra-red Processing Branch. Another function, in preparation for actual operation of the Center, is an Intelligence operation training program. Without this training program it will be impossible to provide interpretation in sufficient quantity to man the Center and data stations.

It is planned that the facilities though GFF, will be operated by contractor personnel to provide a stable organizational structure with full exploitation of accumulated experience.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

II. LOCATION

Location of the facility has not been suggested in the requirements, however, from the study of over-all intelligence requirements and the importance of the data that will be presented, it appears that such a facility should be installed at a site where coordination and liaison for both military and contractor is readily available. More important, it appears that the site should be easily accessible to top level military strategists. Such a site then appears to have its location in or near Washington, D. C. with an airstrip to accommodate all types of military aircraft.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

III. DESCRIPTION AND JUSTIFICATION

The ARS Intelligence Center will consist of a plant complex with buildings or wings designed to the special requirements of three processing and interpretation Branches. Near the processing Branches, display rooms are provided for viewing large scale maps or hemispherical terrestrial reproduction by senior planners and commanders. The display area is planned to be readily accessible to subterranean car ports.

Equipment laboratories, shop areas and modification areas are to be provided in underground floors or separate wings.

The Intelligence Center will be supported by data relayed from Vehicle Intercept, Control and Data Stations. The preliminary processing equipment, although physically located at each Data Station, is an essential link in the Center's operation. While detail design of the relay methods have not been evolved, many existing methods will be critically examined to evolve the most expeditious. Processing at the Center (ARSIC) is accomplished by use of mechanical, photographic, optical and audio-visual equipment; with storage and recall capability by use of a Minicard System.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

In addition to the processing interpretation and display, the activities at the Center will provide intelligence operational training to produce qualified personnel to man ARSIC and Data Station functions. Equipment based on the design of actual operational units will be employed for training purposes, in the pre-Center-activation period. Training programs concurrent with the development of processing equipment for the ARSIC, will furnish operating personnel by the date of readiness of the ARSIC facility itself.

SECRET

MSD 1536

SUBSYSTEM L - VEHICLE GROUND SUPPORT
This facility will service all subsystems requiring Reconnaissance and Telemetry data.

DATE 1 March 1956

ITEM: Vehicle Intercept, Control and Data Acquisition Station

LOCATION: 3 complete stations
East Coast, West Coast, Pacific Area (Hawaiian Islands)

USING AGENCY: Lockheed MSD, CBS Laboratories, Eastman Kodak Co.

BUDGET CONTROL ESTIMATE: $5,000,000 *

NEED DATE:

SCHEDULE: (1956: J A S O N D; 1957: J F M A M J J A S O N D; 1958: J F M A M J J A S O N D; 1959: J F M A M J J A S O N D)

Item	Schedule
Station Building & Equip.	
West Coast	(1) Jul 1956 --These steps to be defined at a later date-- (9) Jun 1958 ------ (10) May 1959
Pacific Area	(1) Jul 1956 --These steps to be defined at a later date-- (9) Nov 1958 ------ (10) May 1959
East Coast	(1) Jul 1956 --These steps to be defined at a later date-- (9) Jan 1959 ------ (10) May 1959
Equipment as itemized for AFMTC in Subsystem J - Vehicle Intercept & Control Ground Station Tab 2	(1) Jul 1956 ------These steps to be defined at a later date------ (10) May 1959

DESCRIPTION AND UTILIZATION:

REMARKS: * This cost is estimated for separate stations. An AFMTC station will be approximately $2,500,000 less.
See following pages for additional information.

Revised Form 108

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

VEHICLE INTERCEPT, CONTROL AND GROUND DATA ACQUISITION STATIONS

I. PURPOSE

In order to provide intercept and contact with the satellite vehicle as it traverses a particular orbit, stations must be activated in locations which provide maximum possible data transmission time. These stations, in order to provide a balance between costs and data transmission, must intercept, control and collect as much useful data as will be significant. Studies to determine the most useful number of such stations have been conducted and results indicate that three stations are needed; two within the bounds of the continental limits and one in the vicinity of Hawaii.

II. LOCATION

Preferred location of the three stations as indicated by previous studies can be pointed out as the Eastern Continental Coast, the Western Continental Coast and the Hawaiian Islands.

III. DESCRIPTION AND JUSTIFICATION

The three stations are conceived as an optimum compromise of coverage, security and logistical support. In addition, an initial station, from consideration of R & D support, will be located at AFMTC. Although

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

this is not an optimum location, it is required so that background will have been established, in the operational problems, by the time continuous orbits are attained.

Each of the stations will contain tracking radar, orbit computer, command transmitter, reconnaissance data receiving recording system and a telemeter type receiving station.

Intra-station communication will involve land line and microwave TV principals, with similar techniques for reconnaissance data transmission to an ARS Central Intelligence Center.

SECRET

SUBSYSTEM L - VEHICLE GROUND SUPPORT
This facility will service all subsystems requiring reconnaissance and telemetry data.

DATE 1 March 1956

ITEM: Flight Test Launching Facility

LOCATION: AFMTC, Fla.

USING AGENCY: Lockheed Aircraft Corporation
Missile Systems Division

BUDGET CONTROL ESTIMATE: GFE & $358,700

NEED DATE: A. January, 1957
B. June, 1958
C. & D. September, 1956

SCHEDULE:

	1956						1957												1958												1959											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
BUILDINGS																																										
A. Occupancy Period	1	8	-	-	-	-	9	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B. Occupancy Period	1	-	-	-	-	-	-	-	-	3	5	6	7	-	8	-	-	-	-	-	-	-	-	9	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C. Occupancy Period	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D. Occupancy Period	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EQUIPMENT																																										
As itemized for AFMTC in Subsystem J - Vehicle Intercept and Control Ground Station Tab - 2	1	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
																																	10	-	-	-	-	-	-	-	-	-

DESCRIPTION AND UTILIZATION:

A. One Half (1/2) of existing Missile Assy. Bldg. (Type #1 of Equip.) including 5000 sq. ft. hard top storage ramp. For Final Assy., minor modification and checkout of test vehicles.
B. Anticipated separate facility for handling of hazardous systems.
C. One (1) igloo in rocket storage area (for rockets).
D. One Half (1/2) igloo in rocket storage area (for igniters and squibs).
For storage of T-65 booster rockets, destruct packages, igniters and squibs.

REMARKS: Present AFMTC facilities will be utilized until January 1957.
See following pages for additional information

SECRET

Revised Form 108

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

AFMTC - CAPE CANAVERAL, FLORIDA

I. PURPOSE

The initial flight test program consisting of 43 System Test Vehicles (STV), 3 Non-Orbiting Test Vehicles (NOTV), 6 Orbital Test Vehicles (OTV) and 15 Payload Test Vehicles (PTV) will be activated at AFMTC. Facilities required for this program are independent of existing X-17 (RTV) facilities. However, to expedite the initiation of the first 4 STV flights, it is planned to phase this activity into the present X-17 operation. Since the vehicles for these flights are less complicated than the RTV vehicles, little difficulty is expected and the work will be accomplished on a non-interruption basis. Separate personnel and equipment will be required for this task.

II. LOCATION

Cape Canaveral, Florida

III. DESCRIPTION AND JUSTIFICATION

Facility requirements include one-half (1/2) Missile Assembly Building for assembly, checkout and minor modification of vehicles. A receiving, assembly and checkout facility for nuclear components, i.e., nuclear apu's. One (1) rocket storage Igloo for Sergeant T-65 rocket solid propellant units which provide STV boost impulse. One-half (1/2) rocket storage Igloo for storage of igniters and squibs.

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

Launching support for the STV's will be on a joint use basis with the X-17 program. Specifically, common use of the pad, blockhouse and modified firing console is intended. Launching support for the NOTV's, OTV's and PTV's will require use of a WS107A launch pad and blockhouse for independent checkout. Joint use of a WS107 pad and blockhouse with Convair crews for mating with the booster and final checkout will also be required.

With the addition of supplementary equipment to the X-17 ground station and mobile checkout consoles, it will be possible to use this gear commonly for both programs. Special checkout equipment for major subsystems will be required for checkout and secondary modification. Ground handling equipment in general will duplicate that used on the X-17 program because of simultaneous schedules.

SECRET

SUBSYSTEM L - VEHICLE GROUND SUPPORT

This facility will service all subsystems requiring reconnaissance and telemetry data.

DATE 1 March 1956

ITEM: Flight Test and Operational Vehicle Launching Facility

LOCATION: Alternate Launching Site

USING AGENCY: Lockheed Aircraft Corporation Missile Systems Division

BUDGET CONTROL ESTIMATE: GFE* & $431,500

NEED DATE: May, 1959

SCHEDULE:

	1956						1957												1958												1959											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
A. Occupancy Period	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	5	-	8	-	-	-	-	-	-	-	-	-	9	-	10	-	-	-	-	-	-	-
B. Occupancy Period	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	5	-	8	-	-	-	-	-	-	-	-	-	9	-	10	-	-	-	-	-	-	-
C. Occupancy Period	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	3	5	-	8	-	-	-	-	-	-	-	-	-	9	-	10	-	-	-	-	-	-	-
Equipment same as for AFMTC itemized in subsystem J Vehicle Intercept and Control Ground Station	1	-	-	-	-	-	-	-	-	Steps to be defined later.																					-	-	-	-	-	-	-	-	-	-	-	-
																															-	9	-	-	-	10	-	-	-	-	-	-

DESCRIPTION AND UTILIZATION:

A. One (1) Assy. Bldg. (16,250 sq. ft.) including 5000 sq. ft. hard top storage ramp. For Final Assy., minor modification and checkout of OPN vehicles.

B. Anticipated separate facility for handling of hazardous systems.

C. One (1) igloo for destruct or igniter storage.

REMARKS: A. Until March, 1963

B. Until March, 1963

See following pages for additional information.

* An estimate of cost for this facility of approximately $25,000,000.00 has been suggested by the Ralph M. Parsons Co.

SECRET

Revised Form 108

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

ALTERNATE LAUNCHING SITE

I. PURPOSE

Launching of the Operational Prototype Test Vehicles (OPT) will require an Alternate Launching Site. A preferable site is, of course, one which avoids placing large populated areas in the dangerous launch envelope. In addition, it is desirable to consider a site at which one of the three vehicle intercept, control and data stations are expected to be located. This Alternate Launching Site will be employed to launch 39 Operational Prototype Test Vehicles (OPT) over a period of approximately 4 years. The facility is expected to be GFF operated by contractor personnel.

II. LOCATION

The specific location of the Alternate Launching Site is undefined at present. Location at one of the three intercept, control and data stations would suggest the Eastern Continental Coast, the Western Continental Coast or the Hawaiian Islands.

III. DESCRIPTION AND JUSTIFICATION

Basically, the Alternate Launching Site will be similar to AFMTC with the supporting features of Patrick Air Force Base incorporated. The

Tab 6 cont'd

Subsystem L - Vehicle Ground Support

major difference is the emphasis on data acquisition, reduction and assimilation as opposed to inflight tracking and telemetry.

To support the personnel required for vehicle assembly, checkout, launching, intercept, control and data assimilation, it is estimated that an additional 750 people will be required for program support at the Alternate Launching Site.

This site should include two launching pads and blockhouses, data and telemetering building, assembly building, control equipment, electronic equipment, liquid oxygen plant, fuel and oxygen storage, generator plant, complete internal communication, outside communication, tracking support, range safety, housing, ground equipment, air conditioning of critical areas, air-strip logistics support, transportation and special electronic, radar and nuclear equipment.

An approximate budget cost of $25,000,000 for engineering, construction, supervision and management has been suggested by the Ralph M. Parsons Co. Also included in this figure are instrumentations pertaining to range safety such as booster impact computers and related equipment, base communications and limited overseas communications.

Estimates of harbor facilities or aircraft landing facilities were not covered because of the unknown terrain.

Tab 7

R & D Contract Funds

Subsystem L - Vehicle Ground Support

Subsystem L. VEHICLE GROUND SUPPORT

Tab 7. R & D Contract Funds (In thousands of dollars)

	FY 57					FY 58					FY 59			FY 60	
LAC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
(1) Research and Development	56	107	142	210	278	310	336	362	398	382	358	403	294	304	
(2) Fabr'cation	31	31	32	54	54	51	60	67	67	46	45	45	24	24	
Sub Total	88	139	174	265	332	361	397	429	460	428	404	448	318	328	
TEST SITES															
(1) Sunnyvale & APGTC	161	254	311	407	503	623	627	813	906	906	885	885	885	885	
Sub Total	249	393	486	673	837	985	1024	1243	1367	1335	1289	1334	1204	1214	
Fee	24	39	48	67	83	98	102	124	136	133	128	133	120	121	
TOTAL*	273	433	536	741	921	1084	1127	1368	1504	1469	1419	1468	1325	1335	
Total Fiscal Year				1986				4500				5860			

*Difference in totals due to rounding

SECRET

Subsystem L. VEHICLE GROUND SUPPORT

Tab 7. R & D Contract Funds (in thousands of dollars) (Cont'd)

	FY 60		FY 61				FY 62						FY 63		
	15	16	17	18	19	20	21	22	23	24	25	26	27		TOTALS
LAO															
(1) Research and Development	369	364	389	384	359	324	299	279	291	296	296	281	167		8,049
(2) Fabrication	6	10	10	10	10	10	-0-	-0-	-0-	-0-	-0-	-0-	-0-		696
Sub Total	375	375	400	395	370	335	299	279	291	296	296	281	167		8,745
TEST SITES															
(1) Sunnyvale & AFMTC	868	888	843	843	782	782	782	782	778	641	504	412	-0-		17,995
Sub Total	1265	1263	1243	1238	1153	1118	1082	1062	1070	938	800	694	167		26,740
Fee	126	126	124	123	115	111	108	106	107	93	80	69	16		2,674
TOTAL*	1392	1390	1368	1362	1268	1230	1191	1169	1173	1032	881	764	183		29,415
Total Fiscal Year		5442				5228				4270			1830		29,415
*Difference in totals due to rounding															

SECRET

Tab 8

Estimate of Manpower Requirements

Subsystem L - Vehicle Ground Support

Subsystem L. VEHICLE GROUND SUPPORT

Tab. 8. Estimate of Manpower Requirements

WORK ITEM	Type of Manpower	QUARTERS 1	2	3	4	5	6	7	8	9	10	11	12	13	14
LAC Research and Development	1-2-3a	11	21	27	40	53	59	66	71	77	75	72	81	59	61
LAC Fabrication and Assembly	4	9	9	9	15	15	14	17	19	19	13	13	13	7	7
Sub-Total		20	30	36	55	68	73	83	90	96	88	85	94	66	68
TEST BASES															
Systems Test Facilities	1-5[b]	10	25	35	45	55	70	70	110	130	130	130	130	130	130
AFMTC	1-5[c]	25	30	30	40	50	60	65	65	65	65	65	65	65	65
Sub-Total		35	55	65	85	105	130	135	175	195	195	195	195	195	195
TOTAL		55	85	101	140	173	203	218	265	291	283	280	289	261	263

Subsystem 1. VEHICLE GROUND SUPPORT

Tab. 8. Estimate of Manpower Requirements

WORK ITEM	Type of Manpower	QUARTERS 15	16	17	18	19	20	21	22	23	24	25	26	27		TOTAL MAN QUARTERS
LAC Research and Development	1-2-3[a]	74	73	78	77	72	65	60	56	58	59	59	56	33		
LAC Fabrication and Assembly	4	2	3	3	3	3	3	0	0	0	0	0	0	0		
Sub-Total		76	76	81	80	75	68	60	56	58	59	59	56	33		1789
TEST BASES																
Systems Test Facilities	1-5[b]	130	130	120	120	110	110	110	110	110	90	70	50			
AFMTC	1-5[c]	65	65	65	65	65	65	65	65	60	50	40	40			
Sub-Total		195	195	185	185	175	175	175	175	170	140	110	90			3925
Total		271	271	266	265	250	243	235	231	228	199	169	146	33		5714

Tab 8, p 3

~~SECRET~~

Pied Piper

MSD 1536

LOCKHEED AIRCRAFT CORPORATION
MISSILE SYSTEMS DIVISION

APPENDIX

~~SECRET~~

Subsystem L - VEHICLE GROUND SUPPORT

APPENDIX

1. IN-PLANT FACILITY SURVEY

1.1 Introduction

A survey was conducted to ascertain the Missile Systems Division potential and capabilities in the event that the subject contract was awarded this facility. For the purpose of this discussion it will be assumed that a firm commitment will be made by the Contractor on or prior to 1 July 1956, that the first test vehicle will be delivered during the month of October 1956 and that thereafter the rate of delivery will be one per month.

The survey covered the following six pertinent points based on the aforementioned premises.

1.2 Buildings and Equipment

Present schedule states buildings at Sunnyvale will be ready for occupancy 1 February 1957. This date could be advanced provided the Contractor gave a definite "go-ahead" within the next 30 days. At the present time it is anticipated that the first 10 vehicles will be completed at the Van Nuys facility. Tentative plans are to fabricate a certain number of vehicles at Van Nuys and complete those vehicles at Sunnyvale so that no production time will be lost while the move is in process.

1.3 Machinery

Appropriations have already been made for the purchase of machinery. Build up in this category will be as follows:

1. Existing machinery will be split between Van Nuys and Sunnyvale as necessary to activate the latter without seriously handicapping the former.
2. Negotiations have already been undertaken to acquire available government equipment.
3. The balance of the machinery will be purchased in the respective areas as required to bring each machine shop up to full capacity.

1.4 Tooling

At the present time it is planned to subcontract all dies, special tools, form blocks, etc. to reliable vendors in the San Francisco area. Contacts have already been made and management has been assured that outside production facilities are more than adequate.

1.5 Jigs and Fixtures

Same as tooling. All new jigs and fixtures will be subcontracted. Sunnyvale will restrict its operations to maintenance and modification activities.

1.6 Manpower

The skilled manpower will be split between the Van Nuys and Sunnyvale facilities, based on actual need. The respective plants will then be brought up to capacity by hiring personnel with lesser skills

and giving them on-the-job training. There is sufficient manpower available for the subject project.

1.7 Training

Plans are now being made to activate training programs in both the Van Nuys and Sunnyvale areas. If necessary, a suitable building will be obtained in the Sunnyvale area to train selected personnel. Training programs will be established and personnel selected so that the required skills can be developed in a minimum amount of time.

2.2 In-plant

The in-plant tests include all tests to determine the performance of the subsystems under the simulated environmental and geophysical conditions which will be encountered during flight. Instrumentation required for these tests will be based on the design specification and will employ standard laboratory test equipment such as recorders, voltmeters, oscilloscopes, vibration pickups, thermocouples, and environmental equipment. Subsystems will be redesigned where necessary to eliminate failures encountered during these tests.

2.3 System Test Facility

At the System Test Facility, complete system tests will be run to evaluate functioning of the entire vehicle. Specialized test consoles or standard laboratory test equipment will be employed to evaluate each of the subsystems. Simulated flight conditions with the proper sequence of events will be instrumented by utilizing the telemetering system and the test equipment described above. Any indications of malfunction of systems or components will be thoroughly investigated and corrected before flight. A telemetering ground receiving station capable of receiving and recording data will be available for these tests. Also, at this location, a complete automatic data reduction facility will be operated to process the instrumented data received during ground and flight test.

2.4 AFMTC

The AFMTC facility will require instrumentation equipment necessary for preflight checkout which includes test consoles for subsystem checkout, and a telemetering ground receiving station. Instrumentation during flight will be furnished by AFMTC tracking and telemetering stations which should be compatible with the data acquisition requirements generated by the missile design parameters. These stations will require modification for long range and orbital flight test to the extent of adding a high gain telemetering antenna which is controlled to track the Pied Piper by following the radar tracking antenna. Tracking of the non-orbiting vehicles will be both optical and radar with the optical tracking being used primarily for instrumentation purposes. Tracking of the orbiting vehicles should result in information concerning drag and atmospheric densities.

3. DEVELOPMENT AND CHECKOUT AND SYSTEM TEST FACILITY

The study of components under conditions which simulate the operational environment will require expansion of existing test equipment. Special machinery will be procured for investigation of the effects of propellants, radiation, vibration, high and low temperatures, induced shock, etc. The testing of components in control chambers of sufficient size for actual operation under simulated flight conditions will shorten the development time. The gain will be in the non-interference factor at AFMTC and at the ultimate site with the use of tested, proven components.

Considerable effort will be necessary with proper safety support to evaluate the effect of the propellants and their vapors on materials, components, and subsystems. The field problems of handling the propellants and associated equipment, the safety of personnel, and the safety of the vehicle will be investigated first in the development section of the Missile Systems Division, with the details of actual handling developed and improved by the personnel in the Systems Test Facility. Most of the in-plant test equipment assigned to the various subsystems and development sections will be devoted to research and evaluation of components and subsystems.

After assembly of the components into working subsystems and into an operating vehicle, specialized checkout and calibration equipment will be utilized for preparing the vehicle either for flight or for captive tests. The space devoted for this operation is also part of

the modification area (for providing last minute changes and improvements). It is advisable to undertake as much of this work at the "in-plant" facility as is possible to allow for a flexible launching schedule. Modification and calibrations at the launch site are difficult at best.

3.1. System Test Facility

The System Test Facility will be located at the Missile Systems Division. The functions will be located in three areas, for protection of operational personnel, plant personnel, and plant facilities. Area One will be devoted to vehicle systems and propulsion; Area Two to components related to propulsion, materials, tests, auxiliary power units, hazard tests and propellant support; Area Three to instrumentation service for the other areas plus office space for personnel assigned to this facility.

The basic system test (Area One) will be centered around a single control building with propellants supplied from a common propellant support section. By utilizing a single building for the local office, shop and maintenance, and by placing the control booths for the different pads therein, considerable safety control can be exercised over the testing. The duplication of equipment and building will be reduced to a reasonable standard. Four pads are planned to be placed in operation. One pad will be devoted to propulsion power plant and systems development testing, two pads to vehicle system testing and calibration, and one pad to environmental operations. The latter will allow complete

in-flight testing under simulated conditions of radiation, shock, etc., with the propulsion unit in full operation. No provision for operation of the propulsion power plant at altitude is considered at this time. Safety against explosions and fire is one of the prime specifications in the facility design.

Area One is being designed with three degrees of safety in mind: Safety to operational personnel against vapors, liquids, fire and explosions; safety to other plant personnel and neighbors against the foregoing; and safety of property. All vapors and liquids will be retained, filtered and altered into less harmful secondary salts and liquids. Those which are still toxic will be placed in drums or containers for disposal in an ocean deep. Pollution of either the air or ground will be prevented to the greatest degree possible. Designs and techniques recently developed for missile testing areas will be employed for fire, noise and blast restraint and control. The design of this facility and the safety program is receiving a completely detailed study in accordance with the high standards of the Lockheed organization.

Area Two, the component area will also contain a central building as outlined for the system area. The function of this area is the testing of propulsion components, materials, handling equipment, hazardous functions, and auxiliary power units. Special altitude chambers for continuous operation of the latter units will be available. This special equipment can also be utilized for propellant expulsion devices, battery radiation, (nuclear) studies, heat radiation, thermal

system will require complete revaluation of the foregoing System Test Facility. The basic propellants and the resultant combustion end products are of a hazardous type. The Lockheed management does not consider it advisable to use these propellants in close proximity to design, development and manufacturing facilities. This testing problem will require an isolated location remote from the Division. The design based upon safety considerations will require additional studies to insure proper protection to all concerned.

4. AFMTC--FACILITIES, SUPPORT & EQUIPMENT REQUIREMENTS

ASSUMPTIONS:

A. 41 STV Flights

26 OTV Flights

	'56	'57	'58	'59	'60	'61	'62	TOTAL
STV	3	12	10	5	5	4	2	41
OTV	0	2	6	6	4	6	2	26
TOTAL	3	14	16	11	9	10	4	67

B. Booster support for the OTV program is undertaken by the ICBM contractor.

4.1 Facilities

4.1.1 One half (1/2) Missile Assembly Bldg. - 16,238 sq ft with overhead crane and necessary utilities.

a. Assembly, checkout and stockroom area - (10,400 sq ft)

b. Machine Shop

c. Telemeter Lab.

d. Instrumentation Lab.

e. Eastman Lab.

f. CBS Lab.

g. Guidance and Control Lab.

h. Engineering

5,838 sq ft

i. Operations

j. Supervision and Adminstration

k. Lavatory, etc.

5,838 sq ft

By September 1957, it is anticipated the facility work load will consist of the following:

One (1) STV in checkout for launching.

One (1) STV in assembly and minor modification.

One (1) OTV in checkout for launching.

One (1) OTV in assembly and minor modification.

4.1.2 Outside Storage Area - Hardtop - 5,000 sq ft

For parking of ground handling equipment, vehicles, etc.

4.1.3 One (1) Rocket Storage Igloo

For storage of T-65 booster rockets and spin rockets.

4.1.4 One half (1/2) Rocket Storage Igloo

For storage of igniters and squibs.

4.1.5 Modification to ICBM Service Tower

Erection of a gantry type crane at top of tower for hoisting and mating the second stage to the first stage booster.

4.1.6 It is anticipated by the contractor that a separate receiving, assembly and checkout facility will be required for hazardous closed chemical and nuclear APU systems.

4.2 Support and Services

4.2.1 Test Data Requirements

a. External: Optics and radar.

b. Internal: Telemetry Receiving Station.

4.2.2 Communications

a. Radio: Range Interstation (airborne-afloat)

b. Telephone: Facility - Base - Range.

c. Commercial TWX: Facility - Home plant.

4.2.3 Weather Forecasts and Data

4.2.4 Aircraft

a. Range Surveillance

b. Frequency Control

4.2.5 Fuels

a. OXIDIZER

9,000 lb per two stage STV launch.

12,000 lb per OTV launch.

b. FUEL

1,300 lb per two stage STV launch.

2,700 lb per OTV launch.

c. HYDRAZINE

210 lb max per two stage STV launch.

2,200 lb max per OTV launch.

4.2.6 Explosives

Local issue and transport of T-65 rockets, destruct charges, igniters and squibs.

4.2.7 Launching Support

a. Contractor requires use of a blockhouse and pad with necessary utilities as follows:

STV - 3 days per launch.

OTV - 3 days per launch (independent checkout).

OTV - 3 days per launch (Joint use with ICBM booster for prelaunch mating and checkout).

b. Sequencer

c. Pad timing

d. Floodlights

e. Public address system

4.2.8 Services (as required basis)

a. Fire Truck

b. Ambulance

c. Flat Bed Truck

d. Mobile Crane

e. Forklift

f. Aero Stand

g. Base Shops

h. Photo Lab.

i. Reproduction

j. Medical

k. Security Guards

l. Food Servies

m. Shipping and Receiving

n. Instrument Loan and Calibration Labs.

4.3 Equipment

4.3.1 Bailed Aircraft

Contractor anticipates requirements for two (2) C-121 type aircraft for airborne testing of advanced systems, antenna patterns, etc.

4.3.2 Ground Handling and Vehicular

a. One (1) STV Erecting Trailer

One (1) OTV Erecting Trailer

Similar to X-17 type trailer. For transport and erection of STV and OTV vehicles.

b. One (1) Truck (1½ ton)

Four (4) Trucks (½ ton)

For local hauling purposes.

c. One (1) Forklift (4000 lb Cap.)

For internal handling of light components at the contractor's facility.

4.3.3 Electrical and Electronic

a. Checkout Console.

For checkout of electrical and electronic equipment in main assembly area.

*b. Mobile Ground Station.

For telemetry, destruct and beacon system check-out on launch pad.

*c. Ground Station Equipment.

For recording telemeter signals during flight and to maintain prelaunch signal quality checks.

4.3.4 Mechanical

Lathes, drill press, grinders, welding equipment, vises, benches, gages, etc.

Necessary fabrication equipment.

4.3.5 Administrative

Desks, chairs, files, cabinets, typewriters, calculating machines, etc.

Necessary administrative support items.

4.3.6 Special

Safe handling equipment for installation and transport of hazardous closed chemical and nuclear APU systems.

* To supplement existing X-17 equipment. Stations to be used for a dual program.

5. LAUNCHING SITE

The requirements for launching of the Operational Prototype Test Vehicles specify that a location different from AFMTC be considered. For discussion at this time, the Alternate Site could be either in the western United States or on an island. This will provide either an over land or over water launch with the latter as the more selective.

Using the preferred site, certain assumptions are normally undertaken to present a broad general plan. Basically, the ultimate site will be another Cape Canaveral with the supporting features of Patrick Air Force Base incorporated. The major difference is the emphasis on data acquisition and reduction as opposed to in-flight tracking.

The base requirements are outlined below in detail. At this time, all the important features will be reviewed. In the discussion, a temperate (semi-tropical) island with port and water facilities is suggested. This has a dual advantage; less power problems, and a more attractive living condition for technical personnel.

The general support of this program including the booster indicates that approximately 750 people will be required for the program and support. The site should include two launching pads, data and telemetering building, control equipment, assembly building, electronic equipment, liquid oxygen plant, fuel and oxygen storage, generator plant, complete

internal communication, tracking support, range safety, housing, ground equipment, air conditioning of critical areas, and other support. Outside communication, airstrip logistics support, transportation, and special electronic, radar, nuclear equipment to be Government-furnished.

A rough figure regarding cost of this site with land supplied is approximately $20,250,000 in the United States. This is based on $7,000/man figure and current construction. Twelve percent should be added for engineering and supervision plus ten percent to island operation as described. An approximate total for this site with special GFE and land is $25,000,000.

ASSUMPTIONS:

A. 36 OPN Flights

	'59	'60	'61	'62	'63	TOTAL
OPN	4	8	6	14	4	36

B. Booster support for the OPN program is undertaken by the ICBM contractor.

C. Base Facilities operated and supplied by government agencies.

5.1 Facilities

5.1.1 One (1) Assembly Bldg. - 16,250 sq ft with overhead crane and necessary utilities

a. Assembly, checkout and stockroom area - (10,400 sq ft)

b. Machine Shop

c. Telemeter Lab.

d. Instrumentation Lab.

5,850 sq ft

OPN - 3 days per launch (independent checkout).

OPN - 3 days per launch (Joint use with ICBM booster for prelaunch mating and checkout).

b. Sequencer

c. Pad timing

d. Floodlights

e. Public Address system

5.2.7 Services (As required basis)

a. Fire Truck

b. Ambulance

c. Flat Bed Truck

d. Mobile Crane

e. Forklift

f. Aero Stand

g. Base Shops

h. Photo Lab.

i. Reproduction

j. Medical

k. Security Guards

l. Food Services

m. Shipping and Receiving

n. Instrument Loan and Calibration Labs.

5.3 Equipment

5.3.1 Ground Handling and Vehicular

a. One (1) OPN Erecting Trailer --

Similar to X-17 type trailer. For transport and erection of OPN vehicles.

b. One (1) Truck ($1\frac{1}{2}$ ton)

Four (4) Trucks ($\frac{1}{2}$ ton)

For local hauling purposes.

c. One (1) Forklift (4000 lb Cap.)

For internal handling of light components at the contractor's facility.

5.3.2 Electrical and Electronic

a. Checkout Console.

For checkout of electrical and electronic equipment in main assembly area.

b. Mobile Ground Station.

For telemetry, destruct and beacon system checkout on launch pad.

c. Ground Station Equipment.

For recording telemeter signals during flight and to maintain prelaunch signal quality checks.

5.3.3 Mechanical

Lathes, drill press, grinders, welding equipment, vises, gages, etc.

Necessary fabrication equipment.

5.3.4 Administrative

Desks, chairs, files, cabinets, typewriters, calculating machines, etc.

Necessary administrative support items.

5.3.5 Special

Safe handling equipment for installation and transport of hazardous closed chemical and nuclear APU systems.